Optimizing Red Hat OpenShift on LinuxONE For Better Outcomes

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"If you can't Measure it,
I am Just Not Interested ™"

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Agenda

- Understanding IBM Z and LinuxONE Consolidation for Optimization
- An Overview of Container Architecture
- The Feedback Loops That Make True Optimization Possible
- Some Case Studies

IBM Z

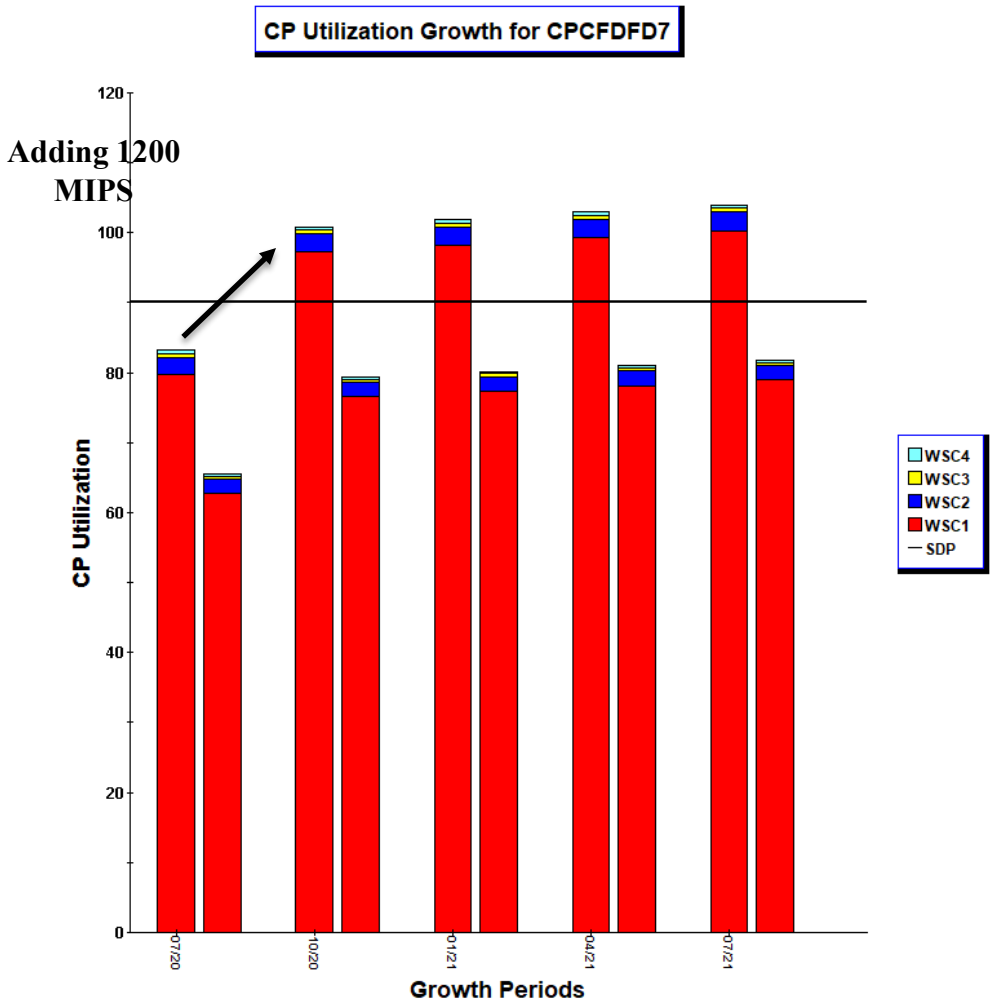
Do more at the core with IBM Z

IBM Z integrates advanced AI into your hybrid cloud, optimizing performance, security and decision-making where critical data resides. Join this track to explore the latest innovations in security, resiliency, performance, and sustainability, showcasing real-world use cases of businesses leveraging the platform for competitive advantage.

TCO's Are Based On Optimized Consolidation

- IBM Z and LinuxONE allow you to over-commit resources for workloads
- Making all of them meet your SLA's requires work with constant feedback loops
- Implementing non-functional requirements requires attention!

CP3000, Capacity Planning Output with Growth

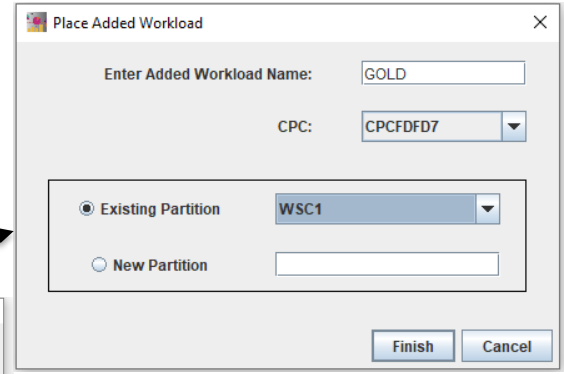


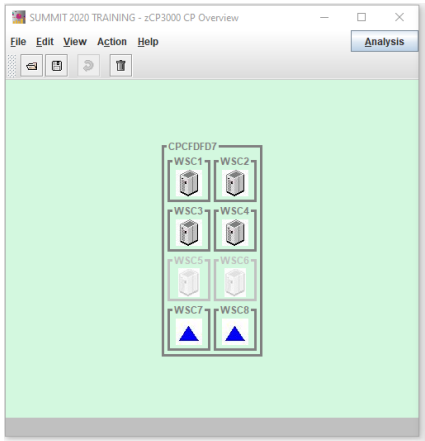
This graph shows the projected utilization of CP engines for each period built from the sum of the partition growth requirements. The average annual growth rate is 25%.

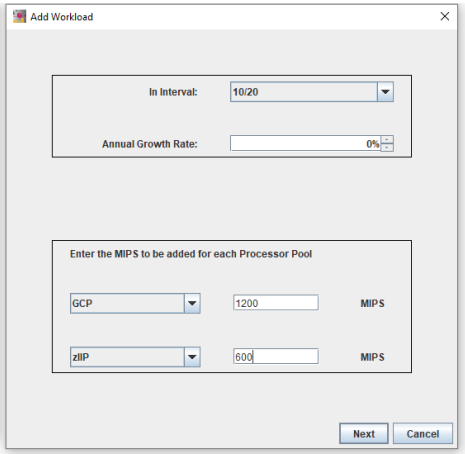
For each date in the projection there are 2 bars. The first bar is the base system. Subsequent bars are the alternate processors. The workload utilization is scaled by the relative **partition** ITRR.

Bar	Model	#CP	Relative ITRR
1	3906-608	8.0	1.0
2	8561-610	10.0	1.27

No breakout of the running workloads







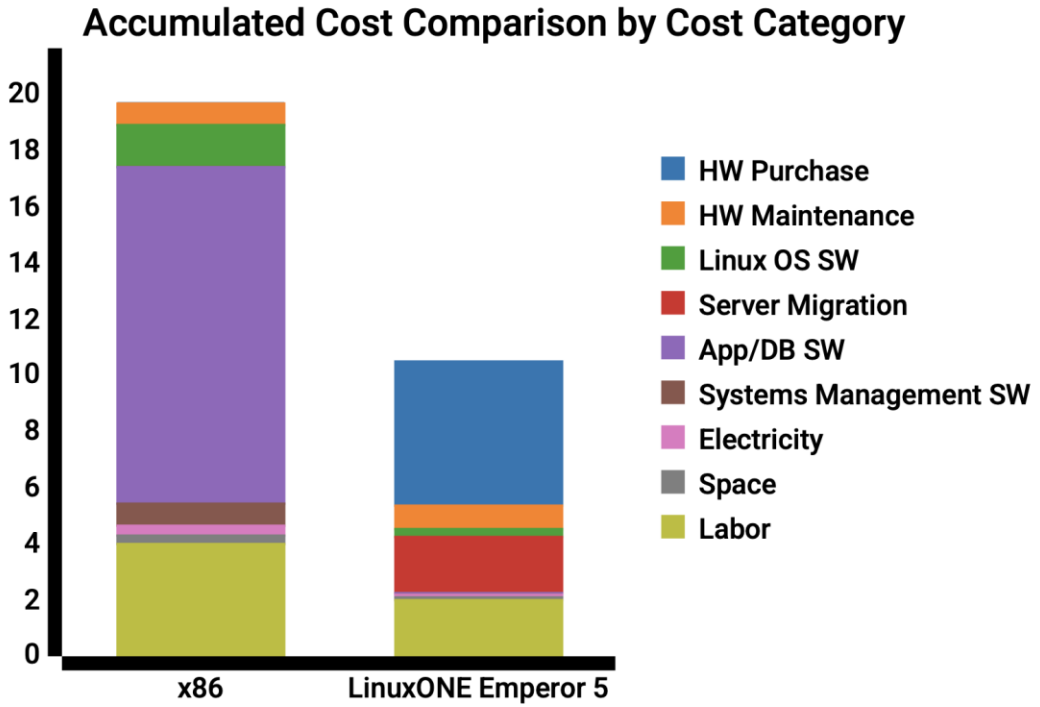
Calculating Costs

Your x86 server inputs

Servers	Type of servers	Workload	Processors per server	Cores per x86 server	# of physical production servers	# of physical non-production servers[1]	Total DR servers[2]	Total DR cores[2]	Total x86 servers	Total x86 cores
3 years old	Blade	opendb	1	8	100	100	0	0	200	1600

IBM® LinuxONE or Linux on Z alternative

IBM® LinuxONE or Linux on Z model	Type of servers	Workload	# of IBM® LinuxONE or Linux on Z servers	# of IBM® LinuxONE or Linux on Z production cores	# of IBM® LinuxONE or Linux on Z non-production cores[1]	Total DR servers[2]	Total DR cores[2]	Total IBM® LinuxONE or Linux on Z servers	Total IBM® LinuxONE or Linux on Z cores[3]
LinuxONE Emperor 5 or z17 ME1	19-inch frame	opendb	1	54	40	0	0	1	94



https://www.ibm.com/resources/z-linuxone-tco-co2e-calculator

Understanding Cost By Year

x86 Costs By Year

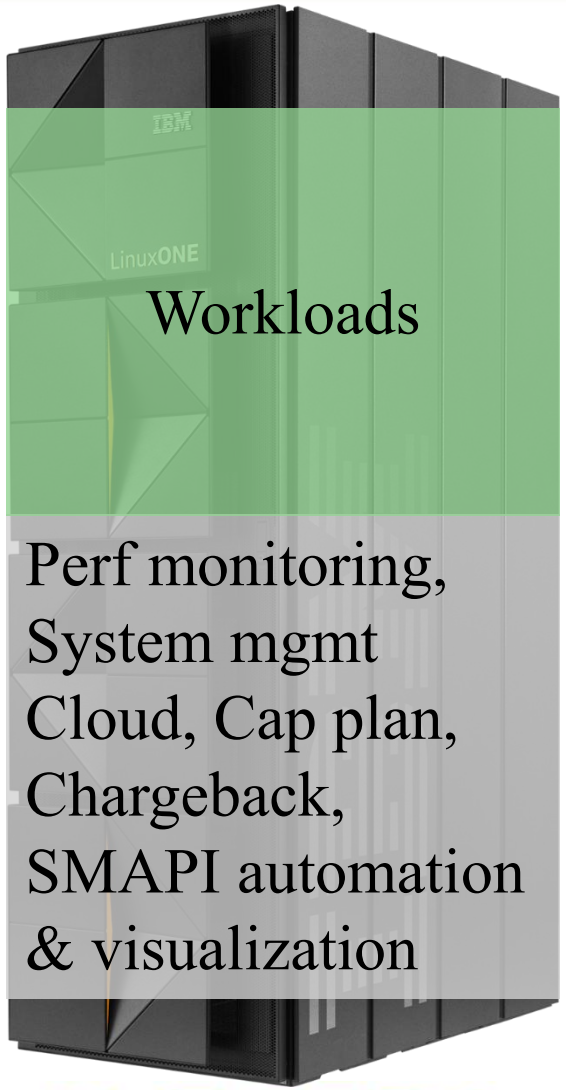
	Year 1	Year 2	Year 3
HW purchase	$0	$0	$0
HW maintenance	$153,300	$153,300	$153,300
HW Maintenance & Linux OS	$0	$0	$0
Server migration	$0	$0	$0
Application/ Database SW	$2,398,400	$2,398,400	$2,398,400
Linux OS SW	$300,000	$300,000	$300,000
Systems Management and Virtualization SW	$157,200	$157,200	$157,200

IBM® LinuxONE or Linux on Z Costs By Year

	Year 1	Year 2	Year 3
HW purchase	$5,136,238	$0	$0
HW maintenance	$0	$0	$0
HW Maintenance & Linux OS	$0	$0	$0
Server migration	$2,000,000	$0	$0
Application/ Database SW	$11,992	$11,992	$11,992
Linux OS SW	$56,400	$56,400	$56,400
Systems Management and Virtualization SW	$0	$0	$0

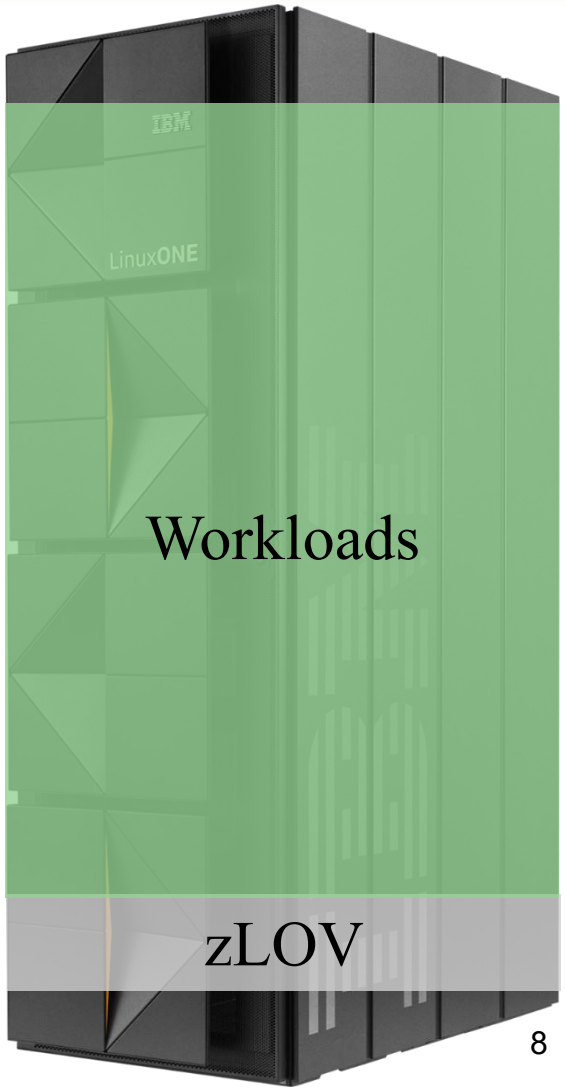
35 YEARS OF PERFORMANCE MANAGEMENT

Run More Workloads With Less



- **Linux on Velocity (zLOV) consumes less than 1% of a processor. Other total solutions require up to 3 processors just to start with.**
- **zLOV requires no additional Linux, JAVA, databases or SMAPI to run.**
- **zLOV memory is measured in MB over the GB required by others.**
- **Velocity's Linux MIB is measured in KB compared to up to 1/2 a GB!**

And Velocity will PUMP data to any other platform or service required!



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PROVEN PERFORMANCE

Topics

Performance Data Collection Technology

Container Architecture

- Docker,
- OpenShift / Kubernetes
- Rancher / Kubernetes

OpenShift Performance Analysis

RHOS Overhead Analysis

Collecting Container Performance Data

Where to Run with Visibility

OpenShift runs on LinuxONE, and in zCX too

- Container technology growing, started with Docker
- Management (capacity planning, performance analysis, chargeback)

High CPU utilization necessary to improve / lower TCO

- 80% is a good peek target for z/VM with good performance over 90%
- KVM best practice is not to exceed 60%
- Tuning skills are a challenge, but required

New visibility “customer” requirement: RHOS metrics

- RHOS needs management visibility
- zCX needs management visibility
- Secure Containers are no longer just black boxes with Velocity
- Velocity Software provides full management visibility into both RHOS and zCX

Performance Management is a Process

Performance Analysis

- Understanding system and application performance
- Resolving current performance issues (z/VM, Linux, network)

Operational Alerts

- Supporting 100's/1000's of servers/containers in many locations
- Defining and automating operational support

Capacity Planning

- Providing input to the financial acquisition process

Accounting / Chargeback

- Building a financial model for resource billing
- Who is consuming the resource?

Performance management can NOT be the performance problem

Black boxes are not managed by definition

RHOS Data Collection Technologies

RHOS Servers are “closed”

- Not open to using SNMP directly
- No collectd
- Pushes data to Prometheus (is the data correct?)
- CPU data incorrect in SMT environment.

Prometheus agents are part of OpenShift (not efficient)

- HTTP interface
- “blob of data” (100k/pod, multiple megabytes per request) (yes, really “blob”)
  - https://github.com/google/cadvisor/blob/master/docs/storage/prometheus.md#prometheus-container-metrics
- Limited metrics
- Significant overhead in parsing every single metric of “blob”

Prometheus “blob” Interface

Generic implementation, parsing not too difficult, just expensive

Each metric tagged in blob:

- container=""
- id="/kubepods.slice/kubepods-burstable.slice/kubepods-burstable-pod81ba15c5_32a2
- image=""
- name=""
- namespace="openshift-monitoring"
- pod="prometheus-k8s-1"} 65382.32 1677698845481 container_cpu_system_seconds_tota

And for comparison:

- container=""
- id="/kubepods.slice/kubepods-besteffort.slice/kubepods-besteffort-pod953ec259_31
- image=""
- name=""
- namespace="vsi-SNMPd-test"
- pod="vsi-SNMPd-test-nzz4b"} 86.61 1677698849149
- container_cpu_system_seconds_tot

OpenShift Performance Data Source

Data sources critical to performance management

SNMP installed in a container

- SNMP is very efficient for collecting performance data!!!
- Full access to systemwide metrics
- Additional metrics collected to align process data with containers
- SNMP is extremely efficient in every comparison
- SNMP container installed on every node

Container Architecture

Containers are not magic

Each container is managed by a “container manager”

- “Virtual” processes inside container are mapped to “real” processes
- File systems are remapped
- Container “limited to what it can see”’

Review Standard Linux Data (Docker)

Standard Linux Process Tree for Docker

```
Report: ESALNXC       LINUX Process Configuration
-------------------------------------------------
Node/          <-------Process Ident-------> Appl
 Name            ID      PPID   GRP     Appl Name
------------ ------- ------- ----- ------- --------
21:32:00
DOCKER
 systemd           1       0     1   61176 systemd
  dockerd       1218       1  1218    1218 dockerd
   docker-c     1339    1218  1339    1218 dockerd
    docker-c   32289    1339 32289    1218 dockerd
     httpd     32312   32289 32312   32312 bouncer1
      httpd    32370   32312 32312   32312 bouncer1
      httpd    32371   32312 32312   32312 bouncer1
      httpd    32372   32312 32312   32312 bouncer1
    docker-c   32476    1339 32476    1218 dockerd
     httpd     32498   32476 32498   32498 bouncer2 <---
      httpd    32553   32498 32498   32498 bouncer2
      httpd    32554   32498 32498   32498 bouncer2
      httpd    32555   32498 32498   32498 bouncer2
```

Linux Process Tree

- Shows all processes
- “PPID” is parent process
- “1” is root
- Dockerd is manager
- Docker-c “container”

Result

- CPU by process
- CPU by container

Docker Container APIs

Docker Configuration APIs added to container SNMP MIB

- Exposed via SNMP
- Image, container names, status
- Internal index, process ID - from “pid file”
- Create / Start / Finish date/time

```
DOCKER Configuration Report
-------------------------------------------------------------------
Time /    <----------Container Configuration------------> Status
Node      Index         ImageName  ContName          Procid
--------  ------------  ---------- ---------------- ------ ------
11:25:00
sles12
          a2e334b2a401  stresscpu  stress4            36448 runn
          6dd81b413dfa  stresscpu  stress3            36360 runn
          e96592194411  stresscpu  stress2            36219 runn
          ab0a179c44c9  stresscpu  stress1            36133 runn
          afc4f3819380  hello-worl hardcore_nash          0 exit
          f57e0f5fd61c  hello-worl pedantic_lamarr       0 exit
```

Docker Container APIs

If have container name, process ID, have CPU

Standard SNMP Linux data collection (VSI MIB):

- 45 metrics per process per minute

Container MIB provides container index and name

By container, data validated against process table data

- User CPU, System CPU

```
Report: ESADOCK2      DOCKER Transaction Report
-------------------------------------------------

Node      <---Container---------> Interval <CPU Percent>
          Index         Name       Seconds  User  System
--------- ------------ ---------- -------  ----- ------
11:25:00
sles12    a2e334b2a401 stress4        60.5   8.7      0
          6dd81b413dfa stress3        60.5   8.1    0.0
          e96592194411 stress2        60.5   5.2    0.0
          ab0a179c44c9 stress1        60.5   5.8    0.0
          afc4f3819380 hardcore_n     60.5     0      0
          f57e0f5fd61c pedantic_l     60.5     0      0
```

Docker Container APIs

Docker "ram" consumption (from standard process data)

Storage Resource consumption by container

- Storage use, paging, file activity

```
Report: ESADOCK2      DOCKER Trans              Velocity Software Corpor
-------------------------------------------------------------------------
                                    <----------Storage in "MB"---------
Node      <---Container--------->   Current                   <Anonymous>
          Index         Name         use    max    cache  rss  inact activ
--------  ------------  ----------  ----- -----  ------ ----  ----- -----
11:25:00
sles12    a2e334b2a401  stress4      4.19  4.53    3.70 0.12  0.11  0.01
          6dd81b413dfa  stress3      3.96 11.64    3.70 0.12  0.11  0.01
          e96592194411  stress2      4.23  5.32    3.70 0.13  0.11  0.01
          ab0a179c44c9  stress1      4.02 11.62    3.70 0.12  0.11  0.01
          afc4f3819380  hardcore_n      0     0       0    0     0     0
          f57e0f5fd61c  pedantic_l      0     0       0    0     0     0
```

Docker File Systems

Filesystems have “link” to container, from standard HOST MIB

Report: **ESAHST2** LINUX HOST File Systems

NODE/ Time/ Date	Index	<-Utilization-> <MegaByte> Size	Used	Pct Full	-Storage------> Description
sles12					
	76	389	0	0	/run/user/0
	25208	64.0	0	0	/var/lib/docker/containers/ab0a179c44c9
	25209	1946	0.0	0.0	/var/lib/docker/containers/ab0a179c44c9
	25211	64.0	0	0	/var/lib/docker/containers/e96592194411
	25212	1946	0.0	0.0	/var/lib/docker/containers/e96592194411
	25214	64.0	0	0	/var/lib/docker/containers/6dd81b413dfa
	25215	1946	0.0	0.0	/var/lib/docker/containers/6dd81b413dfa
	25217	64.0	0	0	/var/lib/docker/containers/**a2e334b2a401**
	25218	1946	0.0	0.0	/var/lib/docker/containers/**a2e334b2a401**

Docker Container APIs

Linux File Systems matched to containers

File systems by container

- File size/utilization
- Description, R/W, boot flags

```
DOCKER File System Report
-------------------------------------------------------------
NODE/Container   <-Utilization->                        <----
Time/     FileSys <MegaByte>  Pct          R/W  Boot Alloc
Date      Index   Size  Used Full  Errors  R/W  Flag Units
--------  -----   ----  ---- ----  ------  ---  ---- -----
11:25:00
sles12
 stress4
          25217     64     0    0       0   No    No  4096
          25218   1946     0  0.0       0   No    No  4096
 stress3
          25214     64     0    0       0   No    No  4096
          25215   1946     0  0.0       0   No    No  4096
 stress2
          25211     64     0    0       0   No    No  4096
          25212   1946     0  0.0       0   No    No  4096
```

OpenShift Process Table

Standard Linux data provided for RHOS

- “conmon” container manager

```
Report: ESALNXC        LINUX Process
Monitor initialized: 03/08/23 at 0
-----------------------------------
Node/          <-------Process Ident
 Name            ID      PPID   GRP
------------ ------- ------- -----
rhoscp1
 systemd           1       0     1
  auditd        1060       1  1060
  dbus-dae      1097       1  1097
  crio          1929       1  1929
  kubelet       1970       1  1970
  conmon        2387       1  2387
   kube-sch     2442    2387  2442
  conmon        2520       1  2520
   cluster-     2559    2520  2559
  conmon        2582       1  2582
   cluster-     2600    2582  2600
  conmon        2677       1  2677
   cluster-     2703    2677  2703
  conmon        8396       1  8396
   promethe     8455    8396  8455
  conmon       10850       1 10850
   grafana-    11073   10850 11073
  conmon     1509339       1  2011
   SNMPd     1509401 1509339  2073
```

CPU by Process

By CPU Consumption by process

- Just the active processes

Report: **ESALNXP** LINUX HOST Process Statistics Report

node/ Name	<Process ID	Ident> PPID	Nice Valu	PRTY Valu	<------CPU Percents----> Tot	sys	user	syst	usrt	
07:02:00										
rhoscp1	0	0	0	0	**139**	19.9	113	3.74	2.87	→ **node totals**
systemd	1	0	0	20	1.62	0.57	1.05	0	0	
crio	1929	1	0	20	6.48	0.15	0.58	3.24	2.51	
kubelet	1970	1	0	20	10.5	3.06	7.47	0	0	
etcd	3078	3061	0	20	15.4	5.91	9.5	0	0	
etcd	3131	3113	0	20	1.67	0.87	0.80	0	0	
cluster-	3959	3944	0	20	2.49	0.23	2.25	0	0	
cluster-	5072	4989	0	20	2.02	0.35	1.67	0	0	
promethe	8455	8396	0	20	**64.1**	3.47	60.6	0	0	
openshif	11221	11167	0	20	2.72	0.32	2.41	0	0	
kube-api	1245253	1245136	0	20	16.7	1.77	15.0	0	0	
oauth-ap	1830274	1830210	0	20	3.29	0.25	3.04	0	0	
rhoscp2	0	0	0	0	**84.2**	18.5	59.4	3.88	2.52	→ **node totals**
systemd	1	0	0	20	2.15	0.67	1.18	0.22	0.08	
crio	2056	1	0	20	5.85	0.18	0.58	3.10	1.98	
kubelet	2091	1	0	20	12.5	3.72	8.81	0	0	
etcd	3185	3169	0	20	14.3	5.33	9.00	0	0	
etcd	3230	3210	0	20	1.35	0.68	0.67	0	0	
cluster-	3277	3258	0	20	2.50	0.23	2.27	0	0	
cluster-	9096	9068	0	20	1.47	0.22	1.25	0	0	
cluster-	10370	10281	0	20	1.02	0.20	0.82	0	0	
openshif	10951	10905	0	20	2.22	0.22	2.00	0	0	
cluster-	11973	11886	0	20	1.50	0.23	1.27	0	0	

CPU Realtime by Process

By CPU Consumption

For " NODE RHOS*", sorted by CPU

Screen: **ESALNXP** Velocity Software - VSIVM4 ESAMON 5.134 03/03 :44-22:45
<--1 of 4 VSI Linux Percent Usage by Process **NODE RHOSCP***
-Process Ident---> <-----CPU Percents----->

Time	Node	Name	ID	PPID	GRP	Tot	sys	user	syst	usrt
22:45:00	rhoscp1	*Totals*	0	0	0	84.5	12.1	67.5	2.9	2.1
	rhoscp3	*Totals*	0	0	0	73.2	9.4	60.7	1.8	1.3
	rhoscp2	*Totals*	0	0	0	53.7	10.4	33.7	2.2	7.5
	rhoscp1	**prometheus**	8455	8396	8455	**38.6**	1.6	37.0	0	0
	rhoscp3	prometheus	7807	7735	7807	**38.4**	1.5	36.9	0	0
	rhoscp1	**etcd**	3078	3061	3078	10.1	3.9	6.1	0	0
	rhoscp2	**kube-apiserv**	1464486	1464276	0	8.4	0.9	7.5	0	0
	rhoscp3	etcd	4129	4099	4129	8.2	3.1	5.1	0	0
	rhoscp1	kube-apiserv	1245253	1245136	65488	7.9	0.8	7.1	0	0
	rhoscp2	etcd	3185	3169	3185	7.7	2.9	4.8	0	0
		systemd	1	0	1	7.3	0.4	0.7	0.2	6.0
		kubelet	2091	1	2091	7.3	2.3	5.1	0	0
	rhoscp1	kubelet	1970	1	1970	6.9	2.0	4.9	0	0
	rhoscp3	kube-apiserv	1609641	1609516	36652	6.7	0.7	6.0	0	0
		kubelet	1880	1	1880	5.3	1.6	3.7	0	0
	rhoscp1	**crio**	1929	1	1929	4.7	0.1	0.3	2.5	1.8
	rhoscp2	crio	2056	1	2056	3.2	0.1	0.3	1.6	1.2
	rhoscp3	crio	1839	1	1839	2.8	0.1	0.2	1.5	1.1
	rhoscp1	oauth-apiser	1830274	1830210	60802	2.1	0.1	2.0	0	0
	rhoscp2	oauth-apiser	694375	694352	0	1.9	0.1	1.8	0	0

CPU Realtime by Pod

Large OpenShift installation…

- CPU by pod
- Pod by container

```
Report: ESAK8S2       Kubernetes Resource Utilization Report
Monitor initialized: 10/15/24 at 17:00:00 on 3932
-------------------------------------------------------------------

NODE/                          <---Container-->  <--Container CPU------->
Time/ PodName                  <--Process ID-->  <------CPU Percents---->
Date   ContainerName            ProcID ProcName   Tot  sys user syst usrt
----------------------  ------ --------  ---- ---- ---- ---- ----
18:00:00
*** Nodes *******
LPIOC330                        (Totals)          34.1 5.67 27.8 0.18 0.50
   apiserver-677df8ff8b                           1.28 0.21 1.06    0    0
    openshift-apiserver   759530 openshif  1.15 0.17 0.98    0    0
   kube-controller-mana                           2.71 0.62 2.09    0    0
    cluster-policy-contr  755380 cluster-  0.53 0.11 0.42    0    0
    kube-controller-mana 3399299 kube-con  2.08 0.47 1.61    0    0
   etcd-vaausclupio330.                           5.97 1.56 4.41    0    0
    etcd                    5084 etcd      4.65 1.35 3.30    0    0
    etcd-readyz          2390617 cluster-  0.90 0.06 0.84    0    0
   apiserver-6475d96f67                           0.61 0.11 0.50    0    0
    oauth-apiserver       752737 oauth-ap  0.61 0.11 0.50    0    0
   packageserver-b67bbf                           1.33 0.23 1.10    0    0
    packageserver         700543 package-  1.33 0.23 1.10    0    0
   ovnkube-node-9xrrg                             0.68 0.13 0.18 0.13 0.24
    ovnkube-controller      5643 ovnkube   0.58 0.11 0.13 0.12 0.23
   machine-config-opera                           0.52 0.07 0.46    0    0
    machine-config-opera  746794 machine-  0.51 0.06 0.45    0    0
   openshift-kube-sched                           0.68 0.15 0.54    0    0
    kube-scheduler        746438 kube-sch  0.61 0.12 0.49    0    0
   console-operator-ff4                           0.68 0.12 0.57    0    0
    console-operator      756863 console   0.55 0.11 0.44    0    0
```

CPU Realtime By Pod

Large OpenShift installation…

- CPU by pod
- Pod by container

```
Report: ESAK8S2       Kubernetes Resource Utilization Report
Monitor initialized: 10/15/24 at 17:00:00 on 3932
-------------------------------------------------------------------

NODE/                          <---Container-->  <--Container CPU------->
Time/ PodName                  <--Process ID-->  <------CPU Percents---->
Date   ContainerName            ProcID ProcName   Tot  sys user syst usrt
------------------------  ------ --------  ---- ---- ---- ---- ----
LPIOC330                    (Totals)          34.1 5.67 27.8 0.18 0.50
   apiserver-677df8ff8b                       1.28 0.21 1.06    0    0
    openshift-apiserver     759530 openshif  1.15 0.17 0.98    0    0
   kube-controller-mana                       2.71 0.62 2.09    0    0
    cluster-policy-contr    755380 cluster-  0.53 0.11 0.42    0    0
    kube-controller-mana   3399299 kube-con  2.08 0.47 1.61    0    0
   etcd-vaausclupio330.                       5.97 1.56 4.41    0    0
    etcd                      5084 etcd       4.65 1.35 3.30    0    0
    etcd-readyz            2390617 cluster-  0.90 0.06 0.84    0    0
```

CPU Extract for Accounting

Chargeback support – database extract: CPU by node by pod / space

Date	Time	NODE	VSIK8S.PODNAME	VSIK8S.PODSPACE	VSIK8S.TOTCPUPCT	VSIK8S.
20241015	173400	LPIOC330	*Totals	""""""""""""""""""	34.15	30731
20241015	173400	LPIOC330	apiserver-677df	openshift-apise	1.15	1038
20241015	173400	LPIOC330	openshift-kube-	openshift-kube-	0.25	228
20241015	173400	LPIOC330	kube-controller	openshift-kube-	0.39	350
20241015	173400	LPIOC330	kube-controller	openshift-kube-	0.53	480
20241015	173400	LPIOC330	kube-controller	openshift-kube-	2.08	1868
20241015	173400	LPIOC330	etcd-vaausclupi	openshift-etcd	4.65	4189
20241015	173400	LPIOC330	etcd-vaausclupi	openshift-etcd	0.41	373
20241015	173400	LPIOC330	etcd-vaausclupi	openshift-etcd	0.90	813
20241015	173400	LPIOC330	controller-mana	openshift-contr	0.33	300
20241015	173400	LPIOC330	route-controlle	openshift-route	0.21	191
20241015	173400	LPIOC330	apiserver-6475d	openshift-oauth	0.61	547
20241015	173400	LPIOC330	packageserver-b	openshift-opera	1.33	1199
20241015	173400	LPIOC330	ovnkube-node-9x	openshift-ovn-k	0.58	526
20241015	173400	LPIOC330	ingress-operato	openshift-ingre	0.15	135
20241015	173400	LPIOC330	node-resolver-k	openshift-dns	0.21	189
20241015	173400	LPIOC330	machine-config-	openshift-machi	0.51	458
20241015	173400	LPIOC330	openshift-kube-	openshift-kube-	0.61	546
20241015	173400	LPIOC330	nmstate-handler	openshift-nmsta	0.21	193

Configuration: RHOS

Container Configuration - RHOS much larger (SNMP in container)…

```
Report: ESAK8S1       Kubernetes Configuration Report                Velocity Sof
Monitor initialized: 06/22/23 at 00:00:00 on 8562                    First record
-------------------------------------------------------------------------------
Linux     <---OpenShift Pod Configuartion-->  <----------Container Configuration
Node/                                                      <--Process Ide
Time      PodName                 PodIndex      Name                 ProcessID Pro
--------  ----------------------  ------------  -------------------- --------- ---
00:15:00
rhoscp1
          insights-operator-7f    ba92ef4e1b29  insights-operator        13075 ins
          multus-admission-con    bbb779ebae39  kube-rbac-proxy          14520 kub
                                                multus-admission-con     12865 web
          etcd-rhoscp1.vsi1.ve    c6088570034c  etcd                      2276 etc
                                                etcd-metrics              2389 etc
                                                etcd-readyz               2941 clu
                                                etcd-health-monitor       3594 clu
          prometheus-operator-    c7875e16a183  prometheus-operator-     11955 pro
          kube-state-metrics-5    d5e9800a6a6c  kube-state-metrics       11658 kub
                                                kube-rbac-proxy-main     12519 kub
                                                kube-rbac-proxy-self     13456 kub
          prometheus-k8s-1        45f9f5becfa0  prometheus               14548 pro
                                                thanos-sidecar           15191 tha
                                                prometheus-proxy         15372 oau
                                                kube-rbac-proxy-than     15931 kub
                                                kube-rbac-proxy          15508 kub
                                                config-reloader          14820 pro
          packageserver-5f99c6    662518f1bc49  packageserver            13044 pac
          vsi-SNMPd-vk5vd         7e583397ff6e  vsi-SNMPd                19285 snm
          multus-9fj4w            8e5c35c1b612  kube-multus               4922 /en
```

CPU by Component/Function

Other components?

- Node “groups” are defined groups of associated servers
- Totals for all RHOS “OpenShif” servers (**Linux perspective**)
- CPU time as measured by Linux – correct???

```
Report: ESALNXA       LINUX HOST Application Report
-------------------------------------------------------
Node/     Process/    ID     <---Processor Percent--->
Date      Application              <Process><Children>
Time      name              Total sys  user syst usrt
--------  ----------- ------ ----- ---- ---- ---- ----
11:25:00
OpenShif  *Totals*         0 351.0 53.4  278 11.8  7.9
          conmon           0 293.1 39.9  251  1.5  1.1
          crio             0 18.68  0.4  1.3 10.3  6.8
          kernel           0  1.37  1.4    0    0    0
          kubelet          0 31.91  9.5 22.4  0.0  0.0
          ovs-vswi         0  1.27  0.7  0.6    0    0
          ovsdb-se         0  0.15  0.0  0.1    0    0
          systemd          0  4.50  1.5  3.0    0    0
```

CPU by Component/Function

Some "better news" from z/VM based measurements

- CPU numbers are traditional, measured by Linux (Thread time)
- **Virtual Machine** with SMT "Prorate" are lower
- IBM SMT numbers do not match reality…. (Same in zCX)
- https://VelocitySoftware.com/tuneguide/smt.html for a detailed explanation of SMT

```
Report: ESAUSP5       User SMT CPU Consumption Analys
-------------------------------------------------
          <------CPU Percent Consumed    (Total)---->
UserID    <Traditional> <MT-Equivalent> <IBM Prorate>
/Class    Total  Virt    Total  Virtual  Total Virtual
-------- ----- -----    -----  -------  ----- -------
07:02:00 414.9  408.0   322.7    317.3  239.7   235.8

 ***User Class Analysis***
OpenShif 355.0  350.3   276.0    272.3  204.9   202.2

 ***Top User Analysis***
RHOSCP1  142.4  140.8   110.1    108.9  82.93   82.01
RHOSCP3  125.2  123.8   97.38    96.34  72.35   71.60
RHOSCP2  86.79  85.04   68.00    66.64  49.31   48.30
```

CPU by Component/Function

Some even "better news"

- CPU numbers are traditional, measured by Linux
- **VSI Prorated** based on HMC data
  - Shows SMT is significantly better

```
Report: ESAUSP5       User SMT CPU Consumption Analysis
-------------------------------------------------------------------
         <------CPU Percent Consumed   (Total)---->  <-TOTAL CPU-->
UserID   <Traditional> <MT-Equivalent> <IBM Prorate> <VSI Prorated>
/Class   Total  Virt   Total  Virtual  Total Virtual Total  Virtual
-------- ----- -----   -----  -------  ----- ------- -----  -------
07:02:00 414.9  408.0  322.7    317.3  239.7   235.8  208.2   204.7
 ***User Class Analysis***
OpenShif 355.0  350.3  276.0    272.3  204.9   202.2  178.1   175.7
 ***Top User Analysis***
RHOSCP1  142.4  140.8  110.1    108.9  82.93   82.01  71.43   70.65
RHOSCP3  125.2  123.8  97.38    96.34  72.35   71.60  62.80   62.14
RHOSCP2  86.79  85.04  68.00    66.64  49.31   48.30  43.55   42.67
```

Chargeback/Capacity Planning

Resource Consumption Model

- Correct the CPU first from SMT
- Aggregate containers into pods
- Aggregate pods by name
- Naming convention allows consumption model

What Else Do We Know?

RHOS Case study:

- Production environment
- 9 nodes, SNMP enabled

```
Linux Release: RHELCoreOS 412.86.202310210217-0
   Linux s01vx9986726 4.18.0-372.76.1.el8_6.s390x
```

What Else Do We Know?

Case study:

Production environment Storage over configured

- ESAUCD2 – 400GB defined, 300GB free.
- CMM works. (CMM container of course)
- Can manage

```
Report: ESAUCD2
----------------------------
Node/     <------------------
Time/     <--Real Storage-->
Date      Total   Avail Used
-------- ------ ----- -----
17:01:00
***Node Groups***
COREOS    410936  303K   98K
*** Nodes *******
RHOSDI1    24156 14201  9955
RHOSDI2    24156 13141 11015
RHOSDM1    24156 10483 13673
RHOSDM2    24156  8964 15192
RHOSDM3    24156 10811 13345
RHOSDWB    96731 90768  5964
RHOSDW1    64475 53776 10699
RHOSDW2    64475 52806 11670
RHOSDW3    64475 55161  9315
```

RHOS Scheduler

How much CPU (vCPUs) should be allocated to RHOS?

- RHOS manages CPU via “millicpu” increments
- PODS / Containers do not start if not sufficient “millicpu”
- One vCPU = 1000 millicpu
- 500 reserved for system

Scheduler Case Study Single Node

Single node, 4 vCPU/threads

CPU Balanced

```
Report: ESALNXS       LINUX VSI System Analysis Report
Monitor initialized: 06/12/25 at 09:59:46 on 8562 ser
-------------------------------------------------------

Node/     <---Load Numbers--> CPU <Processor Pct Util>
Time      Users Procs MaxProc NBR Total Syst User Idle
-------- ----- ----- ------- --- ----- ---- ---- ----
10:01:00
rhossgl1      0   488 4194304 Tot 130.5 24.3  100  255
                                    1  31.4  5.7 24.2 65.1
                                    2  31.3  5.5 24.1 65.3
                                    3  34.1  6.3 26.3 62.3
                                    4  33.5  6.7 25.2 62.6
```

Scheduler Case Study Single Node

Single node, “conmon” (RHOS) using 94% - Application analysis

```
Report: ESALNXA       LINUX HOST Application Report
-------------------------------------------------------
Node/     Process/    ID     <---Processor Percent--->
Date      Application              <Process><Children>
Time      name              Total sys  user syst usrt
--------  ----------- ------ ----- ---- ---- ---- ----
10:01:00
rhossgl1 *Totals*          0 128.3 21.1 94.5  4.9  7.8
         bash           2539  2.15  0.0    0  0.3  1.8
         conmon         3044 94.15 14.3 77.9  0.6  1.4
         crio           2500  8.68  0.3  1.3  3.6  3.5
         kernel            1  0.62  0.6    0    0    0
         kubelet        4071 13.12  3.5  9.5  0.0  0.0
         ovs-vswi       1272  4.10  1.2  2.9    0    0
         ovsdb-se       1140  0.20  0.0  0.2    0    0
         systemd           0  4.88  0.9  2.6  0.4  1.0
         systemd-        879  0.22  0.1  0.1  0.0  0.0
```

Scheduler Case Study Single Node

Single node, conmon (RHOS) using 94%

```
Report: ESAK8S2       Kubernetes Resource Utilization Report
-------------------------------------------------------------------------
NODE/                      <---Container--> Micro  <--Container CPU-------
Time/ PodName              <--Process ID--> <CPU>  <------CPU Percents----
Date   ContainerName        ProcID ProcName         Tot  sys user syst usr
----------------------     ------ -------- -----   ---- ---- ---- ---- ---
rhossgl1                    (Totals)          2546  93.9 14.2 77.7 0.58 1.3
   ovnkube-node-zfnxx                           81  1.62 0.27 0.50 0.28 0.5
    ovn-controller           6320 ovn-cont     81  0.15 0.02 0.13    0
    ovnkube-controller       7571 ovnkube      81  1.43 0.25 0.37 0.27 0.5
   kube-controller-mana                         81  1.85 0.48 1.37    0
   cluster-samples-oper                         20   9.6 1.03 8.55    0
   multus-rqtdx                                 10  0.48 0.03 0.05 0.10 0.3
   console-54c85c9767-q                         10  0.23 0.02 0.22    0
   dns-default-6x68j                            61  0.20 0.07 0.13    0
   prometheus-operator-                          6  0.15 0.05 0.10    0
   prometheus-k8s-0                             76  7.13 0.50 6.63    0
   vsi-snmpd-kdwx6                               2  2.07 0.43 1.63    0
   kube-apiserver-api.s                        296  36.1 4.30 31.8    0
    kube-apiserver         669439 watch-te    296  35.7 4.20 31.5    0
    kube-apiserver-cert-   669569 cluster-    296  0.12 0.03 0.08    0
    kube-apiserver-check   669692 cluster-    296  0.23 0.05 0.18    0
```

Summary

OpenShift / Kubernetes, Docker has the data for:

- Performance Analysis (zombies?)
- Operational Alerts (swapping)
- Capacity Planning
- Chargeback (accurate CPU?)

Data collection with SNMP

- Inexpensive
- Validated
- Measurable by container
- z/OS data needs effective prorate technology

Black boxes will be problematic

Questions?

zVPS
PERFORMANCE SUITE

THE WORLD'S LEADING PERFORMANCE MANAGEMENT SOLUTION FOR Z/VM WITH LINUX AND/OR VSE. NEWLY ADDED SUPPORT FOR Z/OS PLUS NO-CHARGE MONITORING FOR X86 LINUX AND WINDOWS.

zPRO
CLOUD MANAGEMENT

SOLUTION FOR MODERNIZING THE Z/VM PLATFORM, ADDING ON-PREM CLOUD SUPPORT WITH WEB-BASED CONTROLS FOR Z/VM SYSTEM MANAGEMENT PLUS LPAR CLONING AND ANSIBLE PLAYBOOKS USING VELOCITY'S HIGHLY AVAILABLE SMAPI-FREE API'S.

zTUNE
SUPPORT SUBSCRIPTION

VELOCITY SOFTWARE'S ELITE PERFORMANCE SUPPORT SERVICE THAT CREATES AUTOMATED DAILY REPORTS WITH RECOMMENDED ACTIONS

zVRM
RESOURCE MANAGER

REAL-TIME MANAGEMENT FACILITY FOR Z/VM WITH LINUX THAT AUTOMATES SYSTEM SETTINGS USING KNOWLEDGE-BASED INTELLIGENCE TO TUNE WORKLOAD REQUIREMENTS AND OPTIMIZE OVERALL SYSTEM PERFORMANCE.

VELOCITY SOFTWARE

zCX on z/OS?

SNMP works with containerized SNMP

- Standard network data

CPU analysis

- Linux Process data
- Linux System data
- Docker / RHOS container / pod
- SMF records System (70), Job (30)

Storage / ram / Swap

- System
- Process
- Container / pod

zCX on z/OS?

Install zCX with Docker

- "https://velocitysoftware.com/zcximpl.html"

Install SNMP container

- And Yes, it works, and what is it?
- (Linux 5.4.0, Ubuntu Distribution for 390)

SNMP Server Configuration

```
Description:
   Linux 7f1752ffc4e3 5.4.0-146-generic
   #163-Ubuntu SMP Fri Mar 17 18:32:31 UTC 2023 s390x
ObjectId: 01.03.06.01.04.01.BF.08.03.02.0A
```

zCX Network Activity (SNMP)

Two network interfaces

- Ethernet, loopback
- Mac address even

```
Report: ESATCP4
Monitor initialized: 10/27/2
----------------------------
Date/                <Total Octets>
Time                 <-Per second->
Node          IFT  Input   Output
--------- ---- ----- ------
zcxinst1 -   1 555.0  554.96
         - 10 675.2  4715.0
```

```
NODE      Idx        Speed <-Status-> Up   <--------------------Interface--------------->
          Nbr MTU    (Est) Oper Admin Time MACAddress         Description Type
--------- --- ----- ----- ---- ----- ---- ----------------- --------- --------------
zcxinst1    1 65536   10M   UP    UP     0 00:20:20:20:20:20 lo        Software LoopBack
           10  1492   10G   UP    UP     0 02:42:AC:11:00:05 eth0      ETHERNET-CSMACD
```

Next Step: z/OS zCX

zCX, OpenShift run on zIIP in z/OS address space

Linux dashboard: Looks like any other Linux server to us

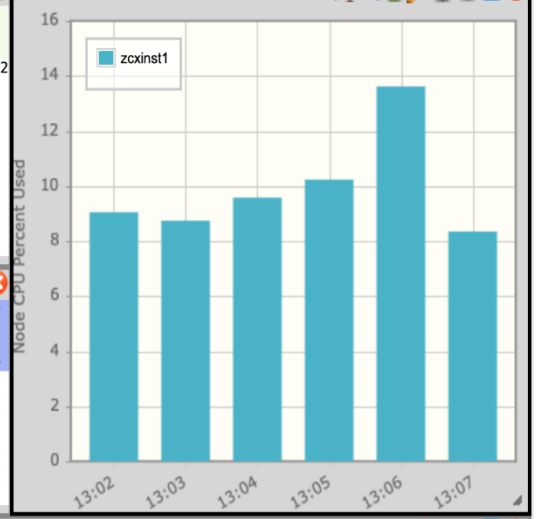
ESALNXP - VSI Linux Percent Usage by Process - VM4

Time	Node	Name	ID	PPID	GRP	Tot	sys	user	syst	usrt	valu	valu	Size	RSS	Peak	Swap	Data	Stk	EXEC	Lib	Lck	PTbl	min	maj
13:08:00	zcxinst1	*Totals*	0	0	0	10.7	6.2	2.7	1.5	0.3	0	0	24K	714	25K	306	2834	12.7	169	1981	336	11.6	17	0
13:08:00	zcxinst1	systemd	1	0	1	0.1	0.0	0.0	0	0	0	20	164	7.4	226	0.7	20.5	0.1	1.3	13.7	0	0.1	0	0
13:08:00	zcxinst1	ksoftirqd/0	10	2	0	0.1	0.1	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0
13:08:00	zcxinst1	rcu_sched	11	2	0	0.1	0.1	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0
13:08:00	zcxinst1	ksoftirqd/1	16	2	0	0.1	0.1	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0
13:08:00	zcxinst1	dmcrypt_writ	603	2	0	0.0	0.0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0
13:08:00	zcxinst1	btrfs-transa	682	2	0	0.0	0.0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0
13:08:00	zcxinst1	systemd-jour	903	1	903	0.1	0.1	0.0	0	0	-1	19	89.1	29.7	111	0.1	18.7	0.1	0.1	13.6	0	0.2	2	0
13:08:00	zcxinst1	multipathd	1029	1	1029	0.1	0.1	0.0	0	0	0	-100	336	16.1	400	0	10.0	0.1	0.1	6.4	336	0.1	0	0
13:08:00	zcxinst1	zcxauthplugi	1083	1	1083	0.1	0.1	0.0	0	0	0	20	469	5.8	469	0.2	142	0.1	2.7	1.9	0	0.1	0	0
13:08:00	zcxinst1	containerd	1085	1	1085	1.1	0.7	0.4	0	0	0	20	1453	19.4	1517	3.4	134	0.1	25.6	1.9	0	0.2	0	0

ESALNXR - Linux Memory Analysis - VM4

Time	Node	Total	Free	Size	Activ	Swap	Total	Activ	Inact	Size	Size	Reclm	Total	Dirty	WrtBk	Total	Used	Chunk	table	Total	Free	Rsvd	Size
13:08:00	zcxinst1	1407	139.7	459.3	237.6	21.7	271.0	128.1	163.2	14.6	257.9	99.0	7.7	0.1	0	126.0	0.1	0	16.9	0	0	0	0
13:07:00	zcxinst1	1407	139.8	458.9	237.0	21.7	271.0	128.1	163.2	14.7	257.8	99.0	7.7	0.1	0	126.0	0.1	0	16.9	0	0	0	0
13:06:00	zcxinst1	1407	140.2	458.5	236.1	21.7	271.0	128.1	163.2	14.7	258.0	99.0	7.6	0.3	0	126.0	0.1	0	16.9	0	0	0	0
13:05:00	zcxinst1	1407	132.2	457.7	235.0	21.7	280.6	137.7	163.2	14.7	258.1	99.0	7.6	0.1	0	126.0	0.1	0	17.2	0	0	0	0
13:04:00	zcxinst1	1407	141.5	457.4	234.6	21.7	270.9	128.1	163.2	14.7	258.1	98.9	7.5	0.2	0	126.0	0.1	0	17.0	0	0	0	0
13:03:00	zcxinst1	1407	142.0	457.2	234.2	21.7	271.0	128.0	163.2	14.7	258.0	98.9	7.5	0.0	0	126.0	0.1	0	16.9	0	0	0	0
13:02:00	zcxinst1	1407	142.0	456.9	233.6	21.7	271.0	128.1	163.2	14.6	258.0	98.9	7.5	0.2	0	126.0	0.1	0	16.9	0	0	0	0

Linux CPU Utilization by Node zcxinst1 - VM4



ESALNXV - LINUX Virtual Processor Analysis Repo - VM4

Time	Node	VM ServerID	Node GroupID	Total	Pct Syst	CPU> User	Total	Process Syst	Data> User	Capture Ratio	Prorate Factor	NVcpu	LPAR Name
13:08:00	zcxinst1	INST1	TheUsrs	10.7	7.7	3.0	10.7	7.7	3.0	1.000	1.000	2	ZOS25A
13:07:00	zcxinst1	INST1	TheUsrs	8.4	6.0	2.3	8.4	6.0	2.3	1.000	1.000	2	ZOS25A
13:06:00	zcxinst1	INST1	TheUsrs	13.6	9.3	4.4	13.6	9.3	4.4	1.000	1.000	2	ZOS25A
13:05:00	zcxinst1	INST1	TheUsrs	10.2	7.5	2.7	10.2	7.5	2.7	1.000	1.000	2	ZOS25A
13:04:00	zcxinst1	INST1	TheUsrs	9.6	6.8	2.8	9.6	6.8	2.8	1.000	1.000	2	ZOS25A
13:03:00	zcxinst1	INST1	TheUsrs	8.7	6.3	2.5	8.7	6.3	2.5	1.000	1.000	2	ZOS25A
13:02:00	zcxinst1	INST1	TheUsrs	9.1	6.5	2.5	9.0	6.5	2.4	0.991	1.000	2	ZOS25A

ESALNXF - VSI Disk File System Performance - VM4

Time	Node	Name	Type	Read I/O> /Second	Sctrs	ms	Write I/O> /Second	Sctrs	ms	I/O <Time(ms)> in <Per I/O> Prog	IOQ	I/O	Device Path
13:08:00	zcxinst1	dm-0	lvm	0	0	0	0	3.3	0	23.0	9.34	0	2.40 9.34 dm-0
13:08:00	zcxinst1	dm-1	lvm	0	0	0	0	3.3	0	23.0	40.7	0	2.65 40.7 dm-1
13:08:00	zcxinst1	dm-2	lvm	0.0	0	32.0	0	0.5	0	88.0	5.16	0	3.13 5.00 dm-2
13:08:00	zcxinst1	vda	disk	0	0	0	0	3.4	0.7	23.9	8.40	0	2.98 3.90 ccw-0.0.0001
13:08:00	zcxinst1	vda1	part	0	0	0	0	0.4	0.4	15.4	2.77	0	5.00 0.38 ccw-0.0.0001-part1
13:08:00	zcxinst1	vda2	part	0	0	0	0	3.0	0.3	25.2	9.21	0	2.68 4.41 ccw-0.0.0001-part2
13:08:00	zcxinst1	vdc	disk	0.0	0	32.0	1.00	0.3	0.2	144	4.68	0	5.00 0.50 ccw-0.0.0004
13:08:00	zcxinst1	vdc1	part	0.0	0	32.0	1.00	0.3	0.2	144	4.68	0	5.00 0.50 ccw-0.0.0004-part1
13:07:00	zcxinst1	dm-0	lvm	0	0	0	0	2.9	0	16.6	17.4	0	4.38 17.4 dm-0

zCX Data Capture (DOCKER)

Linux process table – CPU (zIIP) by process captured

Run some stresser processes (HTTP load)

The Linux system number agrees with the process data

LINUX Virtual Processor Analysis Report

Node/ Name	VM ServerID	Node GroupID	<Linux Pct CPU> Total	Syst	User	<Process Data> Total	Syst	User	Capture Ratio
15:14:00									
zcxinst1	INST1	TheUsers	**88.4**	5.0	83.4	**88.4**	5.0	83.4	**1.000**

Linux process table – CPU by process, Standard Linux

Run some stresser processes (HTTP load)

Report: **ESALNXP** LINUX HOST **Process Statistics** Report

node/ Name	<Process Ident> ID	PPID	Nice Valu	PRTY Valu	<------CPU Percents----> Tot	sys	user	syst	usrt
15:14									
zcxinst1	0	0	0	0	**88.4**	4.28	1.50	0.68	81.9
systemd-	889	1	-1	19	0.45	0.17	0.28	0	0
rsyslogd	1097	1	0	20	0.35	0.12	0.23	0	0
dockerd	2732	1	0	20	3.12	2.73	0.38	0	0
stresser	5518	5490	0	20	**41.2**	0	0	0.32	**40.9**
stresser	5655	5630	0	20	**41.3**	0	0	0.30	**41.0**
SNMPd	**5778**	**5752**	**0**	**20**	**0.17**	**0.13**	**0.03**	0	0
containe	5829	1	0	20	0.13	0.07	0.07	0	0
httpd	5883	**5856**	0	20	0.15	0.10	0.05	0	0
httpd	5884	**5856**	0	20	0.13	0.08	0.05	0	0
httpd	5885	**5856**	0	20	0.13	0.08	0.05	0	0
containe	6009	1	0	20	0.12	0.07	0.05	0	0
httpd	6065	6032	0	20	0.12	0.08	0.03	0	0
httpd	6066	6032	0	20	0.13	0.10	0.03	0	0
httpd	7079	5856	0	20	0.12	0.08	0.03	0	0

Docker containers (configuration, CPU)

- Note Docker assigns names if not provided

```
Report: ESADOCK1      DOCKER Configuration Report
-------------------------------------------------------------------
Time /    <-----------Container Configuration-----------> Status
Node      ContainerName    ImageName  Index         Procid
--------  ---------------  ---------  ------------  -----  ------
15:14:00
zcxinst1
          clever_ramanujan localhost/ 7f1752ffc4e3   5752  runn
          httpd1           httpd      2c9d7574ca87   6032  runn
          httpd2           httpd      1fca2a98a85e   5856  runn
          stress2          stresscpu  1c35d9534623   5518  runn
          stress1          stresscpu  aa927ba72ee6   5655  runn
          ibm_zcx_zos_ssh_ ibm_zcx_zo a3cfd896b4d7   3436  runn
```

Docker containers (configuration, CPU)

- Note Docker assigns names if not provided – clever_ram is SNMP
- NOTE: DOCKER API GIVES INCORRECT CPU
- HTTPd containers getting hit many times a second
- Stress containers CPU intensive

```
Report: ESADOCK2      DOCKER Transaction Report
------------------------------------------------------------------------

                                                          <--Container Me
Node      <---------Container-----------> <CPU Percent> <---Storage met
          Name         Index         ProcID   User  System   Size RSS Peak
-------- ---------- ------------ -------  ----- ------  ---- ---- ----
15:14:00
zcxinst1 clever_ram 7f1752ffc4e3    5752    0.0    0.1  31.8  9.3 31.8
          httpd1     2c9d7574ca87    6032    0.1    0.3  3553  8.6 3617
          httpd2     1fca2a98a85e    5856    0.2    0.3  4736  7.7 4784
          stress2    1c35d9534623    5518   40.9    0.3   4.1  0.8  4.1
          stress1    aa927ba72ee6    5655   41.0    0.3   4.1  0.9  4.1
          ibm_zcx_zo a3cfd896b4d7    3436      0      0   0.9  0.0  0.9
```

From SMF 70 (we have one zIIP in SMT mode)

- V25A is our native z/OS LPAR
- Single zIIP is in SMT, z/OS sees two threads reported (92.8%)

```
Report: ZOSCPU          Z/OS CPU Report
-----------------------------------------
TIME/    <--CPU--> Sample <-CPU Utilization>

SYSID    ID    Type Count   Total   Wait Parked
------   ----  ---- -----   -----  ----- ------
15:12:00 - 15:13:00

V25A        0    GP     1     9.9   90.1      0
            2    GP     1     3.0   97.0      0
            4  zIIP     1    47.6   53.2      0
            5  zIIP     1    45.2   54.8      0
          ---  ---- -----   -----  ----- ------
          Tot    GP     2    12.9  187.1      0
          Tot  zIIP     2    92.8  108.1      0
```

From SMF 70 – LPAR "assigned time" from HMC

- One core assigned (47.6%), two concurrent threads

```
Report: ZOSLPARS      Z/OS LPAR Summary Report
Monitor initialized: needinit at 15:12:00 on Z15S serial
-------------------------------------------------------------
                                    <-------OnLine CPU---------->
TIME/     <--Logical Partition---> <-CPU--> <---%Assigned------>
Date      Name      ID Serial SYSID Type Cnt Total Virtual Entitl
-------- -------- -- ------ ----- ---- --- ----- ------- ------
15:12:00 - 15:13:00
          ZOSLP1   11 0E0F78  V25A GP     2  13.1    12.9   0.44
          ZOSLP1   11 0E0F78  V25A IIP    1  47.8    47.6   0.33
```

zCX z/OS Data

From SMF 30 (job records), only one user of zIIP

- Why is “zIIP on CP”, and why “GP CPU percent”?
- OpenShift is not “free” in terms of GP requirements

z/OS Job/Step CPU/Resources

SYSID	<------JOB---------->			<--CPU Percents-			I	<---zIIP Pct--->			
	Name	JobID	Step Nbr	Total	STD	SRB	T	Tot	Enc	Dep	on CP
15:13:00 - 15:14:00											
V25A	Totals		.	8.92	4.45	3.95		59	0	0.2	1.6
	INST1	**STC05196**	1	**2.88**	1.43	1.10		**59**	0	0.1	**1.4**
	ZOSMNVM2	STC04764	1	0.02	0.02	0		0	0	0	0
	ZOSMNVM4	STC04762	1	0.02	0.02	0		0	0	0	0

So, do we have accurate data?

From SMF 70 – LPAR "assigned time"

- One zIIP core assigned: 47.6% (smf70) (capacity planning/chargeback)
- Two concurrent threads: 92.8% (smf70, 46% average thread))
- Job data zIIP time 59% (smf30)
- Linux (total thread time): 88.4% (from Linux/SNMP)

Why is "zIIP on CP", and why "GP CPU percent"?

- Thread time looks valid within 5%
- Prorate the SMF30 CPU time to "assigned" for SMT. (59 / 47.6 = 1.24)
- Solution to get accurate (or at least much much better) CPU data:
  - Prorate the SMF30 zIIP to / SMF70 HMC Assigned
  - Apply to Linux container CPU data from SNMP

zCX Performance Case Study

zCX has swap defined

- Linux Uses swap when short on storage
- When performance gets bad, is it swapping to disk?
- CMM is NOT an option for zCX
- IBM: Add storage to eliminate swap?
- What is zCX plan for alerts for swapping?
- Note that we get swap space per process, so look at process table

```
Report: ESAUCD2       LINUX UCD Memory Analysis Report
Monitor initialized: 10/27/23
-------------------------------------------------------
Node/     <----------------------Storage Sizes (MegaBytes)
Time/     <--Real Storage--> <-----SWAP Storage----> Total
Date      Total  Avail Used  Total Avail Used  MIN   Avail
-------- ------ ----- ----- ----- ----- ----- ----- -----
15:14:00
*** Nodes *******
zcxinst1 1407.0 312.5  1095  1980  1697 283.3  15.6  2009
```

zCX Performance Case Study

If there is a “bug” or other problem?

- “reboot”???
- Add resources and reboot to hide the problem (for a while)?
- Understand and fix the problem? (30 “uwsgi-core” processes sleeping)
- 81 zombie processes….

Report: **ESALNXP** LINUX Process Statistics Report Velocity Softw

node/ Name	<Process Ident> ID	PPID	<------CPU Percents----> Tot	sys	user	syst	usrt	<---------- Size	RSS	Peak	Stor **Swap**
ZOSLP1	0	0	49.4	0.20	0.21	0.08	48.9	17K	332	17K	**573**
uwsgi-co	1177	1121	0.01	0	0.01	0	0	79	4	79.1	20.9
uwsgi-co	1178	1121	0	0	0	0	0	80	6	79.7	19.2
uwsgi-co	1179	1121	0	0	0	0	0	78	4	78.2	19.3
uwsgi-co	1180	1121	0	0	0	0	0	81	6	80.8	20.5
uwsgi-co	1181	1121	0.01	0	0.01	0	0	79	4	79.5	20.8
uwsgi-co	1182	1121	0	0	0	0	0	79	4	79.3	21.1
uwsgi-co	1183	1121	0	0	0	0	0	78	5	78.5	19.1
uwsgi-co	1184	1121	0	0	0	0	0	79	4	78.7	20.4
uwsgi-co	1185	1121	0	0	0	0	0	79	4	79.5	21.2
uwsgi-co	1186	1121	0	0	0	0	0	79	4	79.7	21.2
uwsgi-co	1187	1121	0	0	0	0	0	79	5	79.4	19.9
uwsgi-co	1188	1121	0.01	0	0.01	0	0	81	7	82.6	18.9

Thank You

zVPS
PERFORMANCE SUITE

THE WORLD'S LEADING PERFORMANCE MANAGEMENT SOLUTION FOR Z/VM WITH LINUX AND/OR VSE. NEWLY ADDED SUPPORT FOR Z/OS PLUS NO-CHARGE MONITORING FOR X86 LINUX AND WINDOWS.

zPRO
CLOUD MANAGEMENT

SOLUTION FOR MODERNIZING THE Z/VM PLATFORM, ADDING ON-PREM CLOUD SUPPORT WITH WEB-BASED CONTROLS FOR Z/VM SYSTEM MANAGEMENT PLUS LPAR CLONING AND ANSIBLE PLAYBOOKS USING VELOCITY'S HIGHLY AVAILABLE SMAPI-FREE API'S.

zTUNE
SUPPORT SUBSCRIPTION

VELOCITY SOFTWARE'S ELITE PERFORMANCE SUPPORT SERVICE THAT CREATES AUTOMATED DAILY REPORTS WITH RECOMMENDED ACTIONS

zVRM
RESOURCE MANAGER

REAL-TIME MANAGEMENT FACILITY FOR Z/VM WITH LINUX THAT AUTOMATES SYSTEM SETTINGS USING KNOWLEDGE-BASED INTELLIGENCE TO TUNE WORKLOAD REQUIREMENTS AND OPTIMIZE OVERALL SYSTEM PERFORMANCE.

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