

openway

be fast. be smart. be unique.

#1 digital payment software platform provider

Operational Monitoring / Konstantin Ryadov

2018

Tokenisation / Switch & E-Commerce Gateway

Isolated enterprise:

- Many OS: AIX POWER, SPARC Solaris, Windows / Linux x86_64
- Domain specific objects (Services, Transactions, Tasks)

Operational Unix-way terminal monitoring (cookbook)

Operational UI monitoring: real-time dashboards Integrated Management Console

what do you need?

- **System:**

- Availability
- Performance
- Errors
- ...

- **Business:**

- Authorization TPS
- Risk Management
- Specific Codes
- ...



Operational monitoring

- **AIX Power**

- LPAR/WPAR

- **Linux x86**

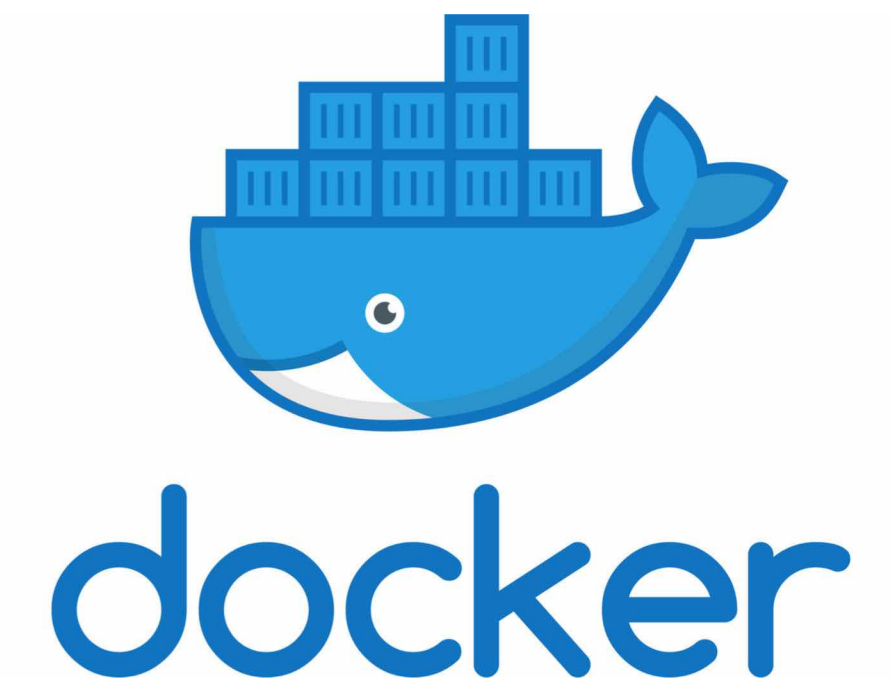
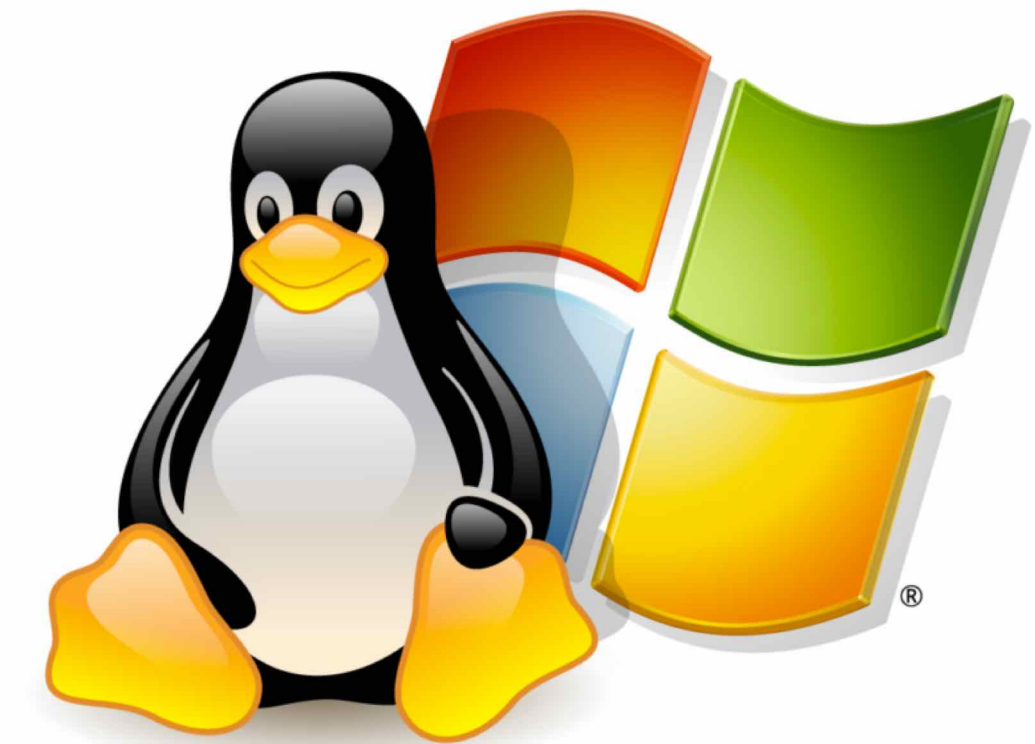
- VM / Containers

- **Solaris x86/SPARC**

- LDOM / Zones

- **Windows x86**

- Hyper-V



Many HW/OS Environment

- **AWS VPC**
 - EC2 / ...
- **GCP VPC**
 - Compute Engine / App Engine
- **RedHat**
 - Openstack / Openshift
- **Microsoft Private Cloud**
 - Azure



Private Cloud Environment

- **AWS VPC**
 - EC2 / ... - [Amazon CloudWatch](#)
- **GCP VPC**
 - Compute Engine / App Engine - [VPC Flow Logs](#)
- **RedHat**
 - Openstack / Openshift - [Operations/Monitoring](#)
- **Microsoft Private Cloud**
 - Azure - [Azure Monitor](#)

Monitoring Categories:

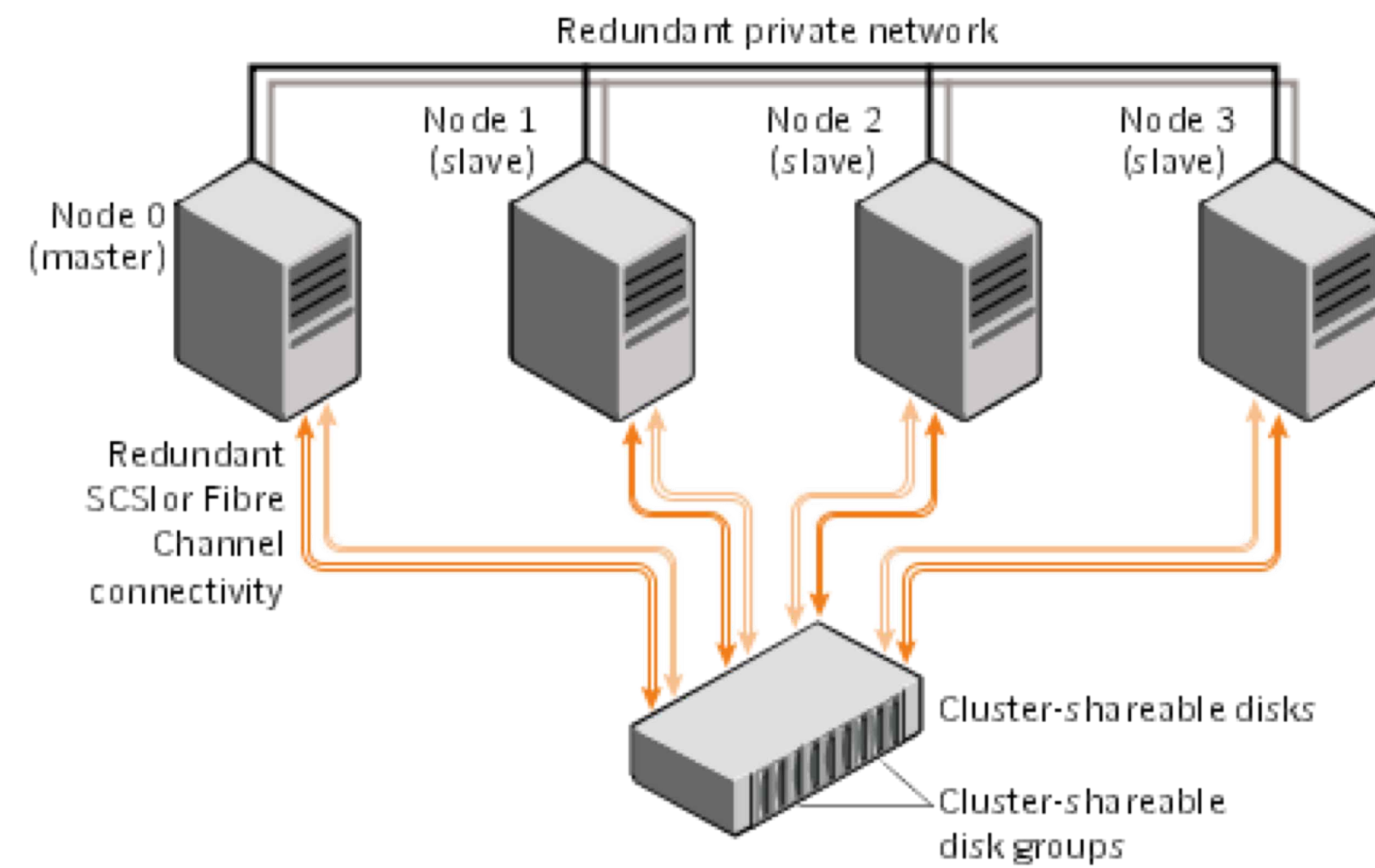
1. Traditional service monitoring
2. Tenant health monitoring
3. Expose this monitoring to tenants
4. Provide monitoring as a service for tenants

Private Cloud Environment

- 1. Many various resources**
- 2. Real-time is needed**
- 3. Many clients (not one project)**
- 4. Centralized?**
- 5. Part of management system?**
- 6. No admin access?**
- 7. Little time to make decision?**

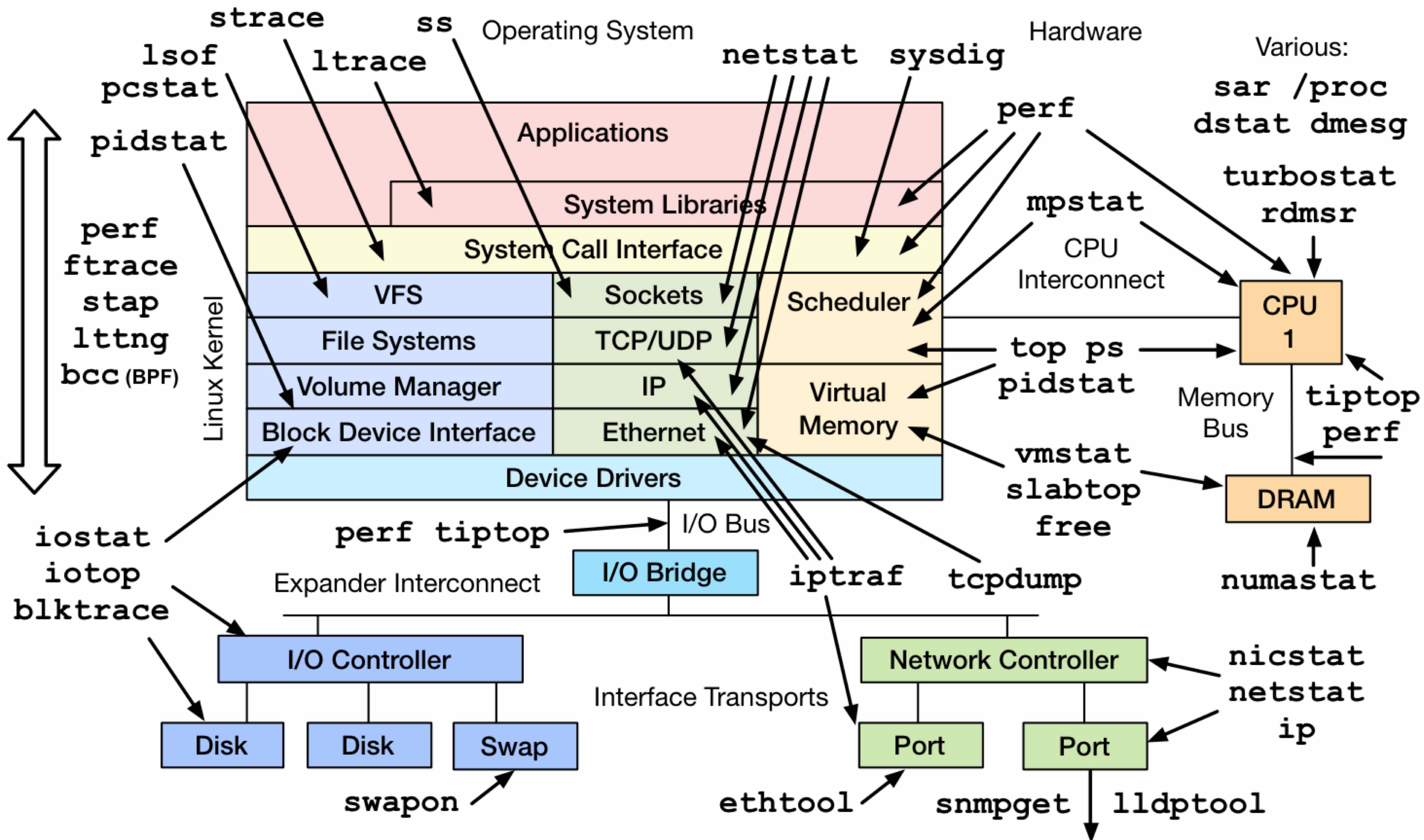
No silver bullet





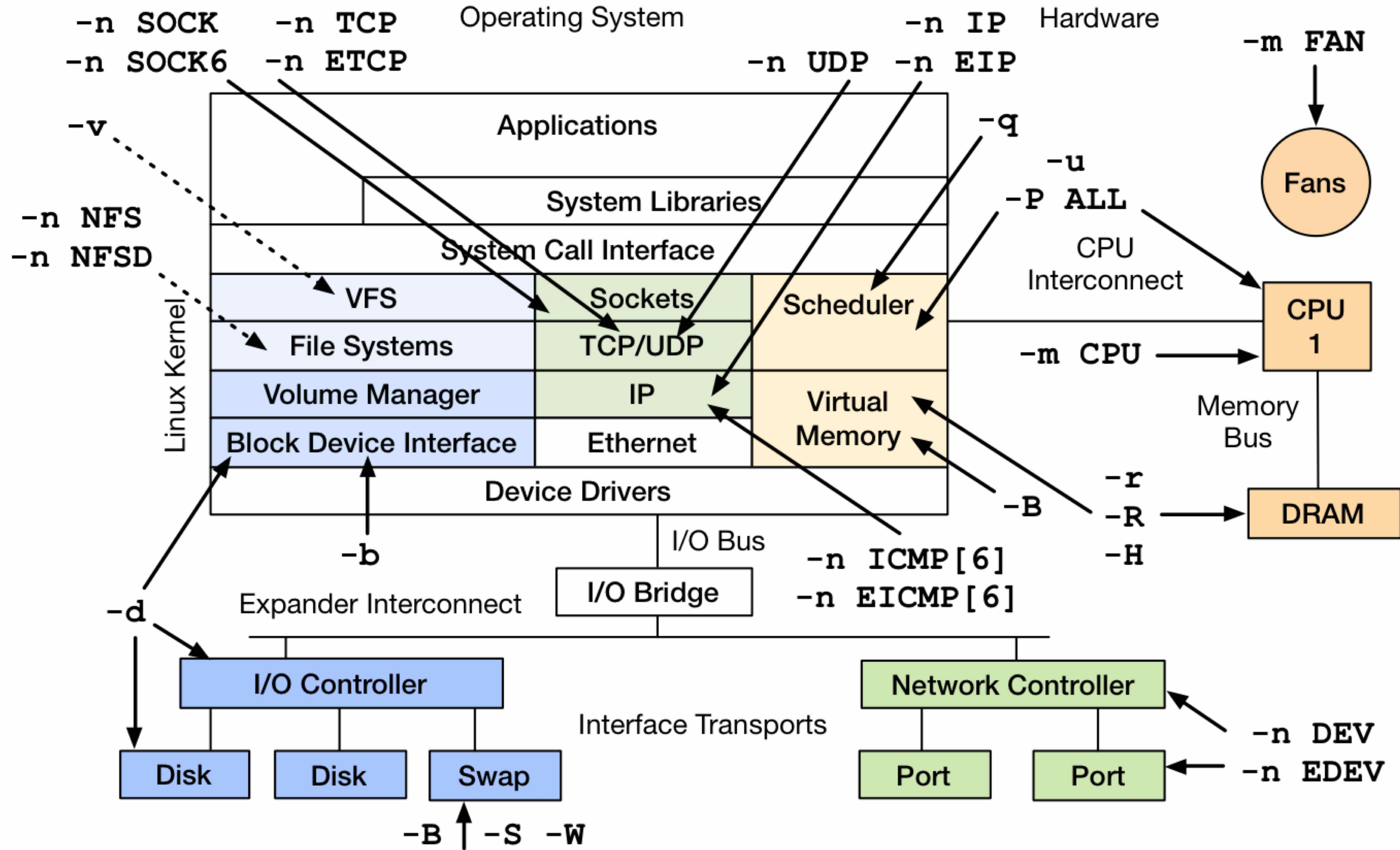
What is available by default?

Linux Performance Observability Tools



Linux

Linux Performance Observability: sar



Linux

```
[root@jds-4 etc]# adduser -M -s `which top` monitor
```

```
[root@jds-4 etc]# cat /etc/passwd |grep monitor
```

```
monitor:x:1006:1006::/home/monitor:/usr/bin/top
```

```
-top - 13:47:58 up 77 days, 17:56, 2 users, load average: 0.05, 0.05, 0.05
```

```
Tasks: 268 total, 1 running, 267 sleeping, 0 stopped, 0 zombie
```

```
%Cpu(s): 0.1 us, 0.1 sy, 0.0 ni, 99.8 id, 0.1 wa, 0.0 hi, 0.0 si, 0.0 st
```

```
KiB Mem : 32770348 total, 11890480 free, 5184572 used, 15695296 buff/cache
```

```
KiB Swap: 16515068 total, 16515068 free, 0 used. 25795348 avail Mem
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
21312	way4	20	0	8099132	451204	19992	S	1.0	1.4	2:44.63	/home/way4/appserver/app
24958	way4	20	0	10.254g	0.978g	17320	S	0.7	3.1	10:52.58	/home/way4/appserver/app
10	root	20	0	0	0	0	S	0.3	0.0	123:13.63	[rcu_sched]
540	root	20	0	0	0	0	S	0.3	0.0	134:29.23	[xfsaild/dm-0]
7381	root	20	0	1566588	19608	4624	S	0.3	0.1	66:19.13	/usr/bin/docker-containe
17583	root	20	0	0	0	0	S	0.3	0.0	0:10.23	[kworker/u48:0]
21227	root	20	0	0	0	0	S	0.3	0.0	0:00.05	[kworker/5:2]
21814	monitor	20	0	54260	2312	1488	R	0.3	0.0	0:00.45	-top
24910	way4	20	0	9423740	882600	15444	S	0.3	2.7	47:34.43	/home/way4/appserver/app
1	root	20	0	51720	3880	2384	S	0.0	0.0	18:19.97	/usr/lib/systemd/systemd
2	root	20	0	0	0	0	S	0.0	0.0	0:04.38	[kthreadd]
3	root	20	0	0	0	0	S	0.0	0.0	0:38.26	[ksoftirqd/0]
5	root	0	-20	0	0	0	S	0.0	0.0	0:00.00	[kworker/0:0H]
8	root	rt	0	0	0	0	S	0.0	0.0	0:00.35	[migration/0]
9	root	20	0	0	0	0	S	0.0	0.0	0:00.01	[rcu_bh]
11	root	rt	0	0	0	0	S	0.0	0.0	0:18.96	[watchdog/0]

Linux top

[docker stats \[OPTIONS\]](#) - Display a live stream of container(s) resource usage statistics

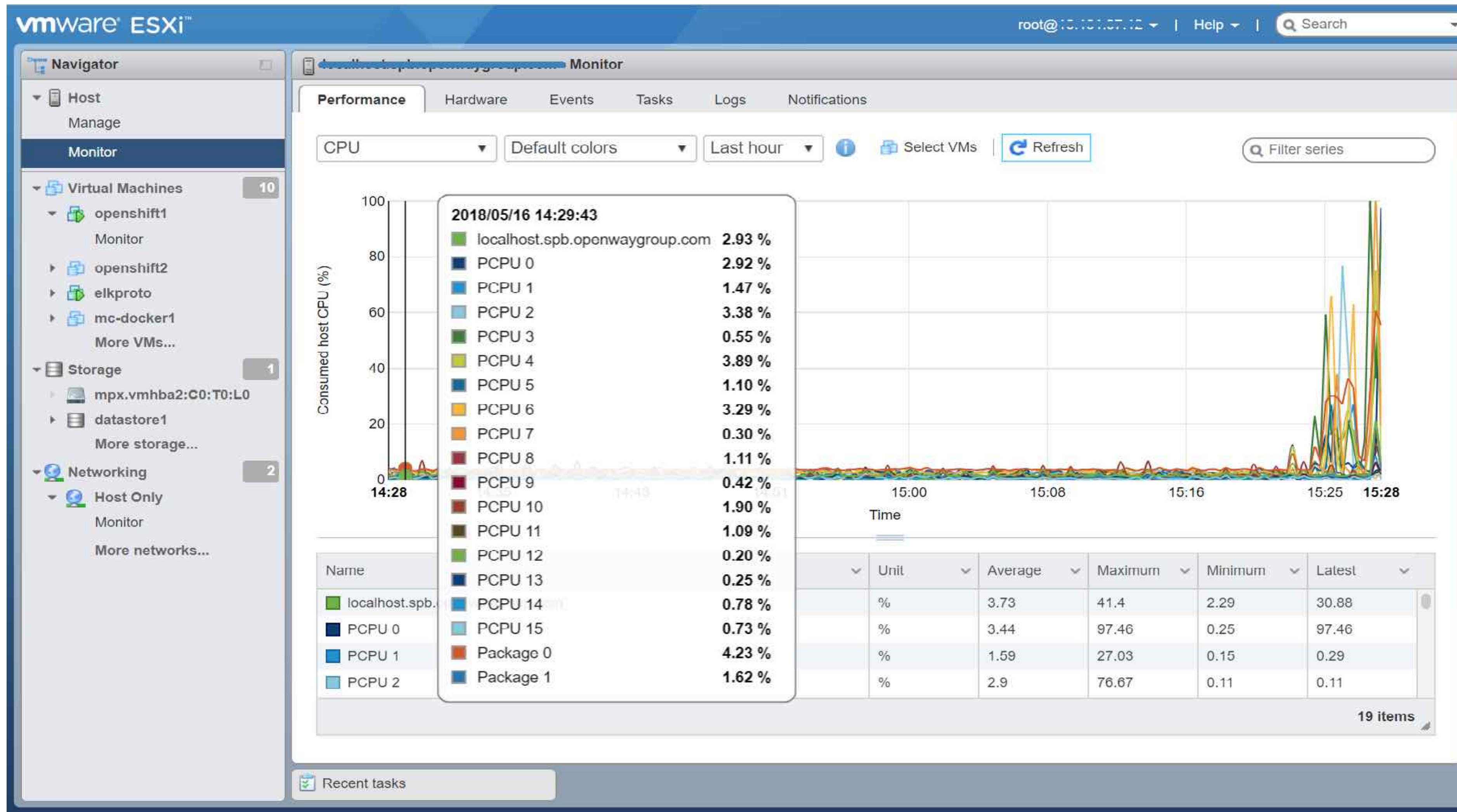
CONTAINER	CPU %	MEM USAGE/LIMIT	MEM %	NET I/O
archive	0.01%	15.75 MiB/7.798 GiB	0.20%	24.08 MiB/23.65 MiB
broadcast	0.15%	180.6 MiB/7.798 GiB	2.26%	49.12 MiB/41.32 MiB
consul	7.57%	22.75 MiB/7.798 GiB	0.28%	0 B/0 B
github-webhooks	0.00%	6.508 MiB/7.798 GiB	0.08%	28.56 MiB/25.7 MiB
grafana	0.01%	15.73 MiB/7.798 GiB	0.20%	9.858 MiB/42.69 MiB
influxdb	0.05%	54.32 MiB/7.798 GiB	0.68%	25.86 MiB/402.6 MiB
master-binaries	0.00%	8.93 MiB/7.798 GiB	0.11%	287.1 MiB/940.5 MiB
master-docs	0.01%	28.16 MiB/7.798 GiB	0.35%	1.047 GiB/5.885 MiB
mysql-drone	0.16%	450.3 MiB/7.798 GiB	5.64%	30.73 MiB/114.4 MiB
nginx	0.01%	26.04 MiB/7.798 GiB	0.33%	0 B/0 B
nsqadmin	0.00%	12.18 MiB/7.798 GiB	0.15%	24.7 MiB/198 MiB
nsqd1	0.72%	12.33 MiB/7.798 GiB	0.15%	38.2 MiB/106.4 MiB
nsqllookupd1	0.08%	10.9 MiB/7.798 GiB	0.14%	34.93 MiB/34.84 MiB
octostats	0.00%	1.02 MiB/7.798 GiB	0.01%	4.786 KiB/4.239 KiB
patch-parser	0.01%	15.07 MiB/7.798 GiB	0.19%	21.47 MiB/3.333 MiB
rethinkdb	0.70%	116.9 MiB/7.798 GiB	1.46%	36.83 MiB/119.8 MiB
znc	0.04%	24.07 MiB/7.798 GiB	0.30%	2.652 MiB/2.045 MiB

Linux docker

4:10:33pm up 88 days 4:10, 637 worlds, 4 VMs, 14 vCPUs; CPU load average: 0.04, 0.03, 0.03										
PCPU USED(%): 0.9 1.4 9.2 0.9 0.7 2.9 0.9 2.4 0.4 1.1 0.9 0.3 0.5 0.6 2.1 0.6 AVG: 1.6										
PCPU UTIL(%): 1.4 2.2 7.6 1.3 1.2 4.7 1.6 3.9 0.6 1.6 1.5 0.5 0.7 1.0 3.2 1.0 AVG: 2.1										
CORE UTIL(%): 3.5 8.8 5.7 4.9 2.2 1.9 1.7 4.1 AVG: 4.1										
ID	GID	NAME	NWLD	%USED	%RUN	%SYS	%WAIT	%VMWAIT	%RDY	%IDLE
321619	321619	openshift1	12	10.42	14.98	0.11	1162.78	0.00	0.11	378.27
4059617	4059617	db-escrow	12	3.49	4.95	0.07	1172.77	3.10	0.14	384.57
4262160	4262160	esxtop.1115357	1	2.35	2.77	0.00	95.38	-	0.00	0.00
4058498	4058498	escrow-cards-ma	12	2.08	2.74	0.00	1174.91	0.42	0.21	389.41
1030426	1030426	elkproto	10	1.63	2.05	0.02	979.39	0.00	0.10	194.47
1	1	system	225	0.49	1541.90	0.00	20511.16	-	29.28	0.00
5550	5550	hostd.66880	33	0.19	0.23	0.00	3238.79	-	0.02	0.00
5298	5298	rhttpproxy.6684	20	0.05	0.06	0.00	1962.98	-	0.02	0.00
12043	12043	dcui.67814	4	0.04	0.07	0.00	392.48	-	0.07	0.00
1019	1019	vmsyslogd.65896	3	0.04	0.05	0.00	294.40	-	0.01	0.00
8	8	helper	131	0.04	0.05	0.00	12856.85	-	0.01	0.00
10664	10664	vpxa.67560	24	0.02	0.04	0.00	2355.67	-	0.02	0.00
11751	11751	sfcB-ProviderMa	9	0.02	0.02	0.00	883.37	-	0.00	0.00
4262032	4262032	sshd.1115338	1	0.02	0.02	0.00	98.13	-	0.00	0.00
2036	2036	net-lacp.66164	3	0.01	0.01	0.00	294.43	-	0.01	0.00
2399	2399	nfsgssd.66380	1	0.00	0.01	0.00	98.14	-	0.00	0.00
11311	11311	openwsmand.6767	3	0.00	0.01	0.00	294.45	-	0.01	0.00
3496	3496	ntpd.66611	1	0.00	0.00	0.00	98.15	-	0.00	0.00
9	9	drivers	12	0.00	0.00	0.00	1177.72	-	0.01	0.00
4465	4465	vmware-usbarbit	1	0.00	0.00	0.00	98.15	-	0.00	0.00
4097	4097	ioFilterVPServe	2	0.00	0.00	0.00	196.30	-	0.00	0.00
3840	3840	swapobjd.66656	1	0.00	0.00	0.00	98.15	-	0.00	0.00
10056	10056	dcibd.67482	1	0.00	0.00	0.00	98.15	-	0.00	0.00
2765	2765	busybox.66502	1	0.00	0.00	0.00	98.15	-	0.00	0.00
9704	9704	slpd.67433	1	0.00	0.00	0.00	98.15	-	0.00	0.00

esxtop

VMware ESXi



VMware ESXi console

top, vmstat, iostat, fsstat, netstat and **ldm list**

```
root@sunsrv1:~# ldm list
```

NAME	STATE	FLAGS	CONS	VCPU	MEMORY	UTIL	NORM	UPTIME
primary	active	-n-cv-	UART	4	16G	4.0%	4.0%	697d 18h
as-sol	bound	-----	5005	8	8G			
netserv	active	-n----	5003	4	4G	6.1%	6.1%	17d 16h 10m
padss	active	-n----	5007	2	8G	8.3%	8.3%	199d 20h
solmnode	active	-n----	5004	12	32G	2.7%	2.7%	196d 1h
sunset	active	-n----	5000	8	8G	0.4%	0.4%	196d
tcsol1	active	-n----	5001	8	12G	11%	11%	1d 10h 10m
tcsol2	active	-n----	5002	8	12G	0.2%	0.2%	22h 59m

Oracle Solaris 11



```

CPU      User% Kern% Wait% Idle%   Physc  Entc%
Total    27.1  55.8   1.8  15.4   13.32 332.89

Network  BPS   I-Pkts  O-Pkts   B-In  B-Out
Total    157M   18.8K   110K    1.01M 156M

Disk     Busy%    BPS    TPS   B-Read  B-Writ
Total    2.2     288M   2.50K   273M    14.8M

FileSystem      BPS    TPS   B-Read  B-Writ
Total           169M   4.27K   164M    4.70M

Name          PID   CPU%  PgSp Owner
oracle       15335782  2.9  41.4M oracle
oracle       44499414  2.8  41.6M oracle
oracle       40960198  2.8  41.4M oracle
oracle       59769262  2.6   121M oracle
oracle       47055006  2.6  15.6M oracle
oracle       60817436  2.4  12.1M oracle
oracle       28639618  2.3  11.7M oracle
oracle       23921400  1.4  11.3M oracle
oracle       16646458  1.3  33.8M oracle
guard_st     16580608  0.8   104M root
aioserve     35979818  0.8   448K oracle

Syscall  42264  Writech  58.6M
Reads    5033  Rawin    12
Writes   4909  Ttyout   410
Forks    49    Igets    0
Execs    29    Namei    10887
Runqueue 21.00  Dirblk   0
Waitqueue 5.0

PAGING
Faults    60865
Steals     0
PgspIn    0
PgspOut    0
PageIn    70054
PageOut    3566
Sios      73888

MEMORY
Real,MB   131072
% Comp    48
% Noncomp 44
% Client  44

PAGING SPACE
Size,MB   65536
% Used    0
% Free    100

NFS (calls/sec)
SerV2     0  WPAR Activ  0
CliV2     0  WPAR Total  0
SerV3     0  Press: "h"-help
CliV3     0  "q"-quit

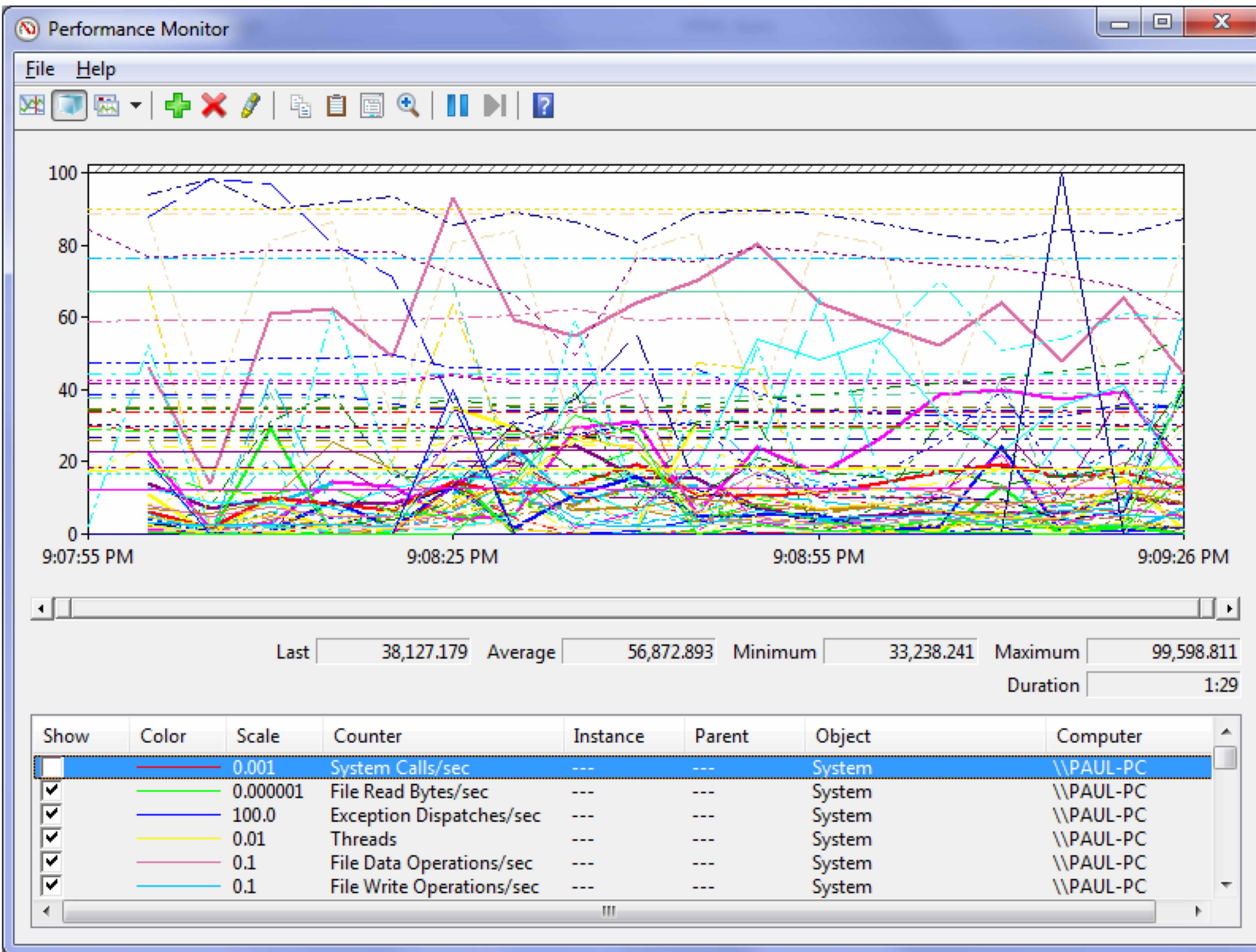
```

topas

- Reports
selected
local and
remote
system
statistics.

IBM AIX





1. OS Metrics
2. Hyper-V metrics
3. Process / business metrics

Windows

Multi-execution mode: comands are typed to all terminals (use Ctrl+Shift+Insert to paste)

Multi-paste

Exit multi-execution mode

Topas Monitor for host:asemtest1

Wed May 16 16:20:38 2018 Interval:2

CPU	User%	Kern%	Wait%	Idle%	Physc	Entc%
Total	0.1	0.4	0.0	99.5	0.02	0.99

Network	BPS	I-Pkts	O-Pkts	B-In	B-Out
Total	1.84K	14.00	13.50	845.5	1.01K

Disk	Busy%	BPS	TPS	B-Read	B-Writ
Total	0.0	0	0	0	0

FileSystem	BPS	TPS	B-Read	B-Writ
Total	44.8K	45.50	43.1K	1.75K

Name	PID	CPU%	PgSp	Owner
zabbix_a	10158160	0.1	844K	zabbix
topas_nm	15990954	0.0	3.96M	root
xmgc	983070	0.0	448K	root
topas	9830614	0.0	3.21M	way4
zabbix_a	7274712	0.0	2.45M	zabbix
java	10748034	0.0	69.8M	root
getty	9240640	0.0	700K	root
gil	5243040	0.0	960K	root
sshd	11337932	0.0	1.20M	way4
aso	9044004	0.0	1.45M	root
java	11468834	0.0	72.3M	pconsole

EVENTS/QUEUES	FILE/TTY
Cswitch 287	Readch 44269
Syscall 1429	Writech 2189
Reads 53	Rawin 0
Writes 11	Ttyout 224
Forks 1	Igets 0
Execs 1	Namei 71
Runqueue 0	Dirblk 0
Waitqueue 0.0	

PAGING	MEMORY
Real,MB 32768	
Faults 220	% Comp 15
Steals 0	% Noncomp 71
PgspIn 0	% Client 71
PgspOut 0	
PageIn 0	PAGING SPACE
PageOut 0	Size,MB 512
Sios 0	% Used 4
	% Free 96

NFS (calls/sec)	WPAR Activ 0
Serv2 0	WPAR Total 0
Cliv2 0	Press: "h"-help
Serv3 0	"q"-quit
Cliv3 0	
Serv4 0	
Cliv4 0	

top - 16:24:29 up 236 days, 22:24, 1 user, load average: 0.00, 0.01, Tasks: 194 total, 1 running, 193 sleeping, 0 stopped, 0 zombie

%Cpu(s): 0.0/0.0 0[

%Node0 : 0.0/0.0 0[

KiB Mem : 16267504 total, 4928252 free, 830696 used, 10508556 buff/

KiB Swap: 2097148 total, 1939704 free, 157444 used. 14963152 avail

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+
12541	way4	20	0	157848	2384	1576	R	0.7	0.0	0:00.50
7015	way4	20	0	3924932	366728	17240	S	0.3	2.3	9:30.97
24846	zabbix	20	0	80992	1364	1224	S	0.3	0.0	16:18.74
1	root	20	0	46028	4644	2944	S	0.0	0.0	28:55.42
2	root	20	0	0	0	0	S	0.0	0.0	0:05.24
3	root	20	0	0	0	0	S	0.0	0.0	12:17.38
5	root	0	-20	0	0	0	S	0.0	0.0	0:00.00
7	root	rt	0	0	0	0	S	0.0	0.0	1:46.26
8	root	20	0	0	0	0	S	0.0	0.0	0:00.00
9	root	20	0	0	0	0	S	0.0	0.0	174:06.75
10	root	rt	0	0	0	0	S	0.0	0.0	1:13.33
11	root	rt	0	0	0	0	S	0.0	0.0	1:06.17
12	root	rt	0	0	0	0	S	0.0	0.0	1:42.32

Disable this terminal from "MultiExec" mode

load averages: 0.23, 0.41, 0.43; up 204+02:07:56 16:1401 threads: 1392 sleeping, 8 zombie, 1 on cpu

CPU: 99.5% idle, 0.1% user, 0.4% kernel, 0.0% iowait, 0.0% swap

Kernel: 576 ctxsw, 94 trap, 780 intr, 710 syscall, 56 flt

Memory: 8192M phys mem, 3368M free mem, 6144M total swap, 6144M free s

PID	LWP	USERNAME	PRI	NICE	SIZE	RES	STATE	TIME	CPU	COMMAND
28871	1	way4	59	0	5256K	4368K	cpu/4	0:01	0.03%	top
10694	1	103	59	0	6640K	2944K	sleep	597:46	0.02%	zabbix_
5247	33	way4	59	0	299M	230M	sleep	6:55	0.01%	java
5217	33	way4	59	0	352M	301M	sleep	6:52	0.01%	java
819	1	way4	59	0	5992K	3536K	sleep	94:02	0.00%	zabbix_
5217	11	way4	59	0	352M	301M	sleep	2:42	0.00%	java
5247	11	way4	59	0	299M	230M	sleep	2:10	0.00%	java
5217	57	way4	59	0	352M	301M	sleep	0:10	0.00%	java
18991	1	101	59	0	9648K	3080K	sleep	1:45	0.00%	zabbix_
10282	1	101	59	0	9520K	2744K	sleep	47:34	0.00%	zabbix_
28332	1	101	59	0	5864K	2808K	sleep	5:55	0.00%	zabbix_
27302	1	101	59	0	5864K	2912K	sleep	0:26	0.00%	zabbix_
818	1	way4	59	0	5992K	3088K	sleep	45:46	0.00%	zabbix_
5217	23	way4	59	0	352M	301M	sleep	0:40	0.00%	java

Disable this terminal from "MultiExec" mode

Resource Monitor

File Monitor Help

Overview CPU Memory Disk Network

CPU 53% CPU Usage 123% Maxim...

	PID	Descri...	Status	Threads
Image				
ShellExperienceHost...	3592	Wind...	Suspe...	34
SearchUI.exe	15628	Searc...	Suspe...	51
SkypeHost.exe	1292	Micro...	Suspe...	54
LockApp.exe	28872	LockA...	Suspe...	13
WinStore.App.exe	19140	Store	Suspe...	30
Music.UI.exe	33000	Music...	Suspe...	17
SystemSettings.exe	5436	Settings	Suspe...	49
Calculator.exe	14168	Calcul...	Suspe...	23
Microsoft.Photos.exe	24400	Micro...	Suspe...	20

Disk 13 KB/sec Disk... 1% Highest Ac...

Network 18 Kbps Netw... 0% Network U...

CPU 100%

60 Seconds 0%

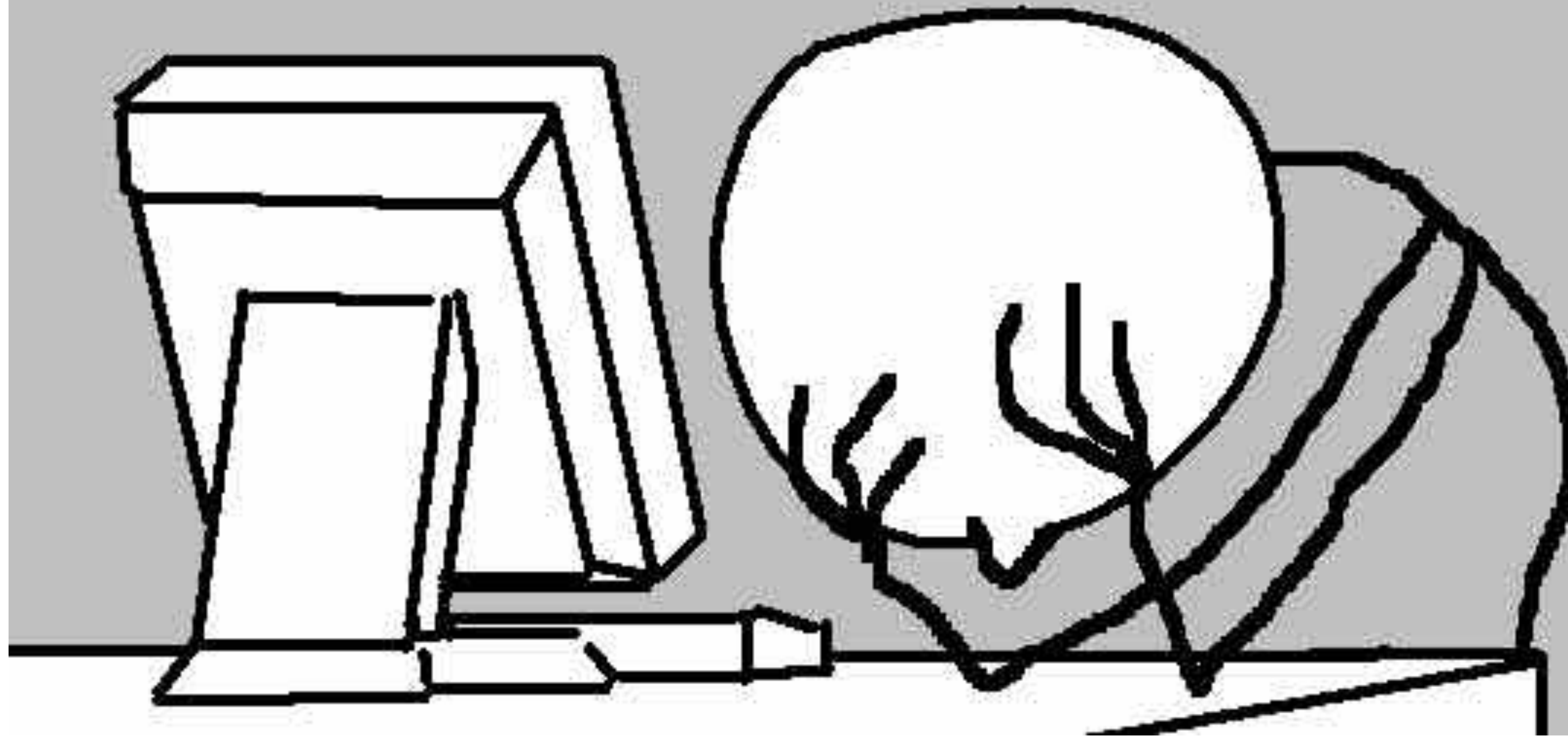
Disk 1 MB/sec 0

Mix them all ...

Should I buy commercial soft

or

use opensource for
operational monitoring*?



...

Last 20 issues

HOST	ISSUE	LAST CHANGE	AGE	INFO	ACK	ACTIONS
Zabbix server 1	Zabbix discoverer processes more than 75% busy	2016-02-12 10:43:39	4m 33s		No	1
Zabbix server 2					Yes 4	

Scripts menu:

- SCRIPTS
 - Default
 - Local
- GO TO
 - Host inventory
 - Latest data
 - Triggers
 - Graphs
 - Host screens

Summary table:

AVERAGE	WARNING	INFORMATION	NOT CLASSIFIED
0	0	0	0
0	0	0	0

Monitoring & Management

1. Define business needs / domain (simple as possible)

1. E.g. we need to monitor **Servers** => **Applications** => **Business Services**
2. Our metrics are: **CPU/RAM usage, Application status, Uptime, Errors Count, TPS**
3. **Multiplatform!!!**

2. Evaluate: Calculate Cost and ROI

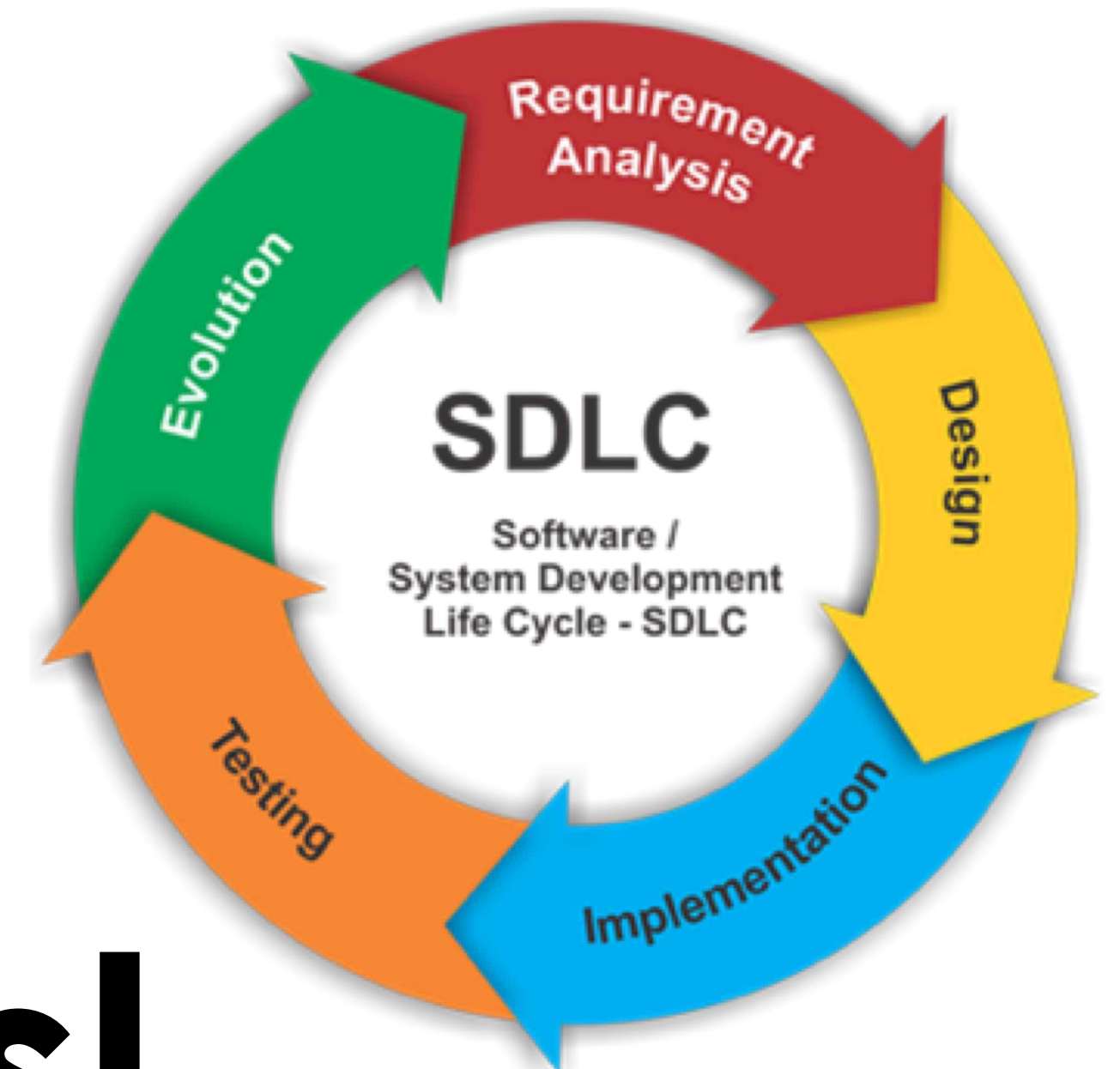
1. **Planning + Architecture**
2. (Master/Slave + CQRS + **Java**) + PoC (5 nodes cluster)

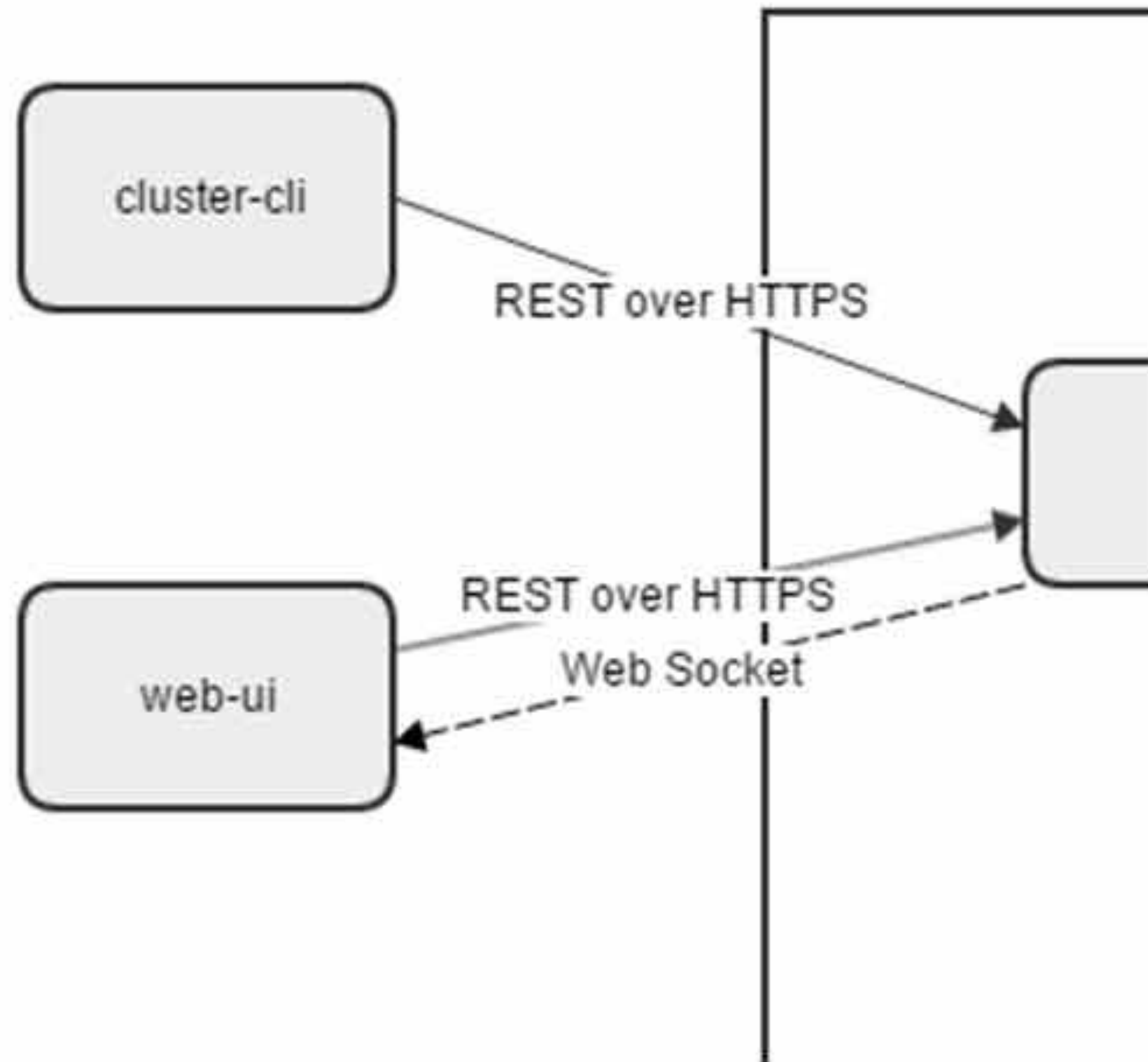
3. Produce it

1. Development + Dev QA + DevOps + Pilot QA + ProdOps

4. Profit!

You have developers!





AWS-compatible REST

Typical architecture

Servers = OS

way4

Application Server Console

admin

Applications

Services

Servers

Configurations

Actions

Servers List

REFRESH

SERVER	IP	TYPE	VERSION	STATUS	CPU USAGE	MEMORY	UPTIME	OPERATING SYSTEM
		master	1.7.702	● UP	1 %	87 %	21:02:13	AIX(7.2)
		slave	1.7.702	● UP	1 %	87 %	21:19:10	AIX(7.2)
		master	1.7.702	● UP	2 %	64 %	22:05:19	Linux(3.10.0-693.17.1.el7.x86_64)
		master	1.7.702	● UP	2 %	63 %	22:02:01	Linux(3.10.0-693.17.1.el7.x86_64)
		master	1.7.702	● UP	0 %	47 %	21:14:50	Linux(3.10.0-693.17.1.el7.x86_64)
		slave	1.7.702	● UP	0 %	64 %	21:45:33	Linux(3.10.0-693.17.1.el7.x86_64)
		slave	1.7.702	● UP	0 %	62 %	22:17:05	Windows Server 2012 R2

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way4

Application Server Console

admin

Applications

Services

Servers

Configurations

Actions

Applications List

ADD FILTER

REFRESH

Name

logag

Server

NAME	SERVER	STATUS	ACTIONS	VERSION	RESTARTS	HTTP PORT	START TIME
logagent		STARTED		2.0.909	0		18-05-07 19:51
logagent		STARTED		2.0.909	0		18-05-07 19:36
logagent		STOPPED		2.0.909	0		
logagent		STOPPED		2.0.909	0		
logagent		STOPPED		2.0.909	0		
logagent		STOPPED		2.0.909	0		
logagent		STOPPED		2.0.909	0		

Business+OS = Applications

Services List

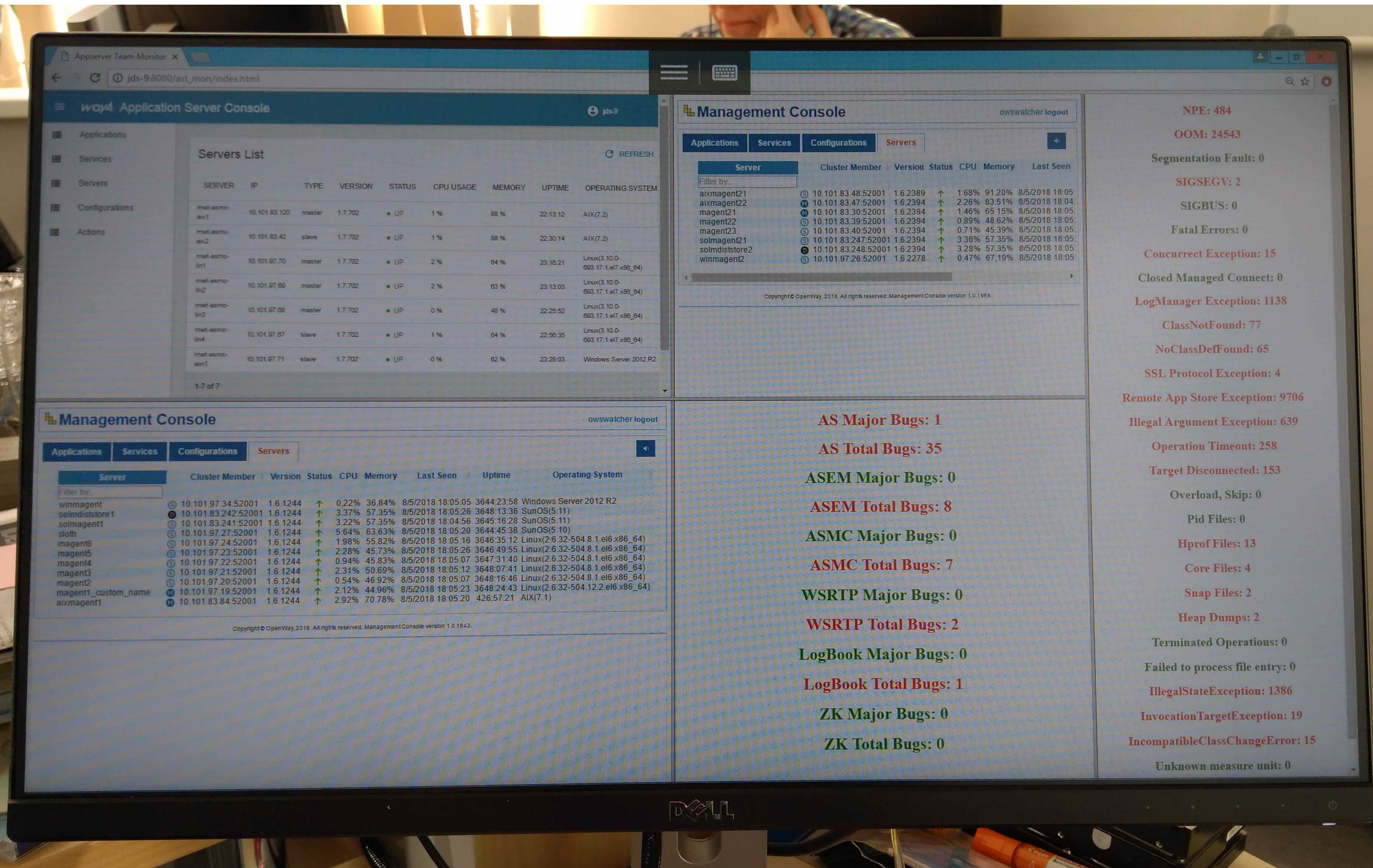
ADD FILTER REFRESH

Service

SERVICE	APPLICATION	SERVER	STATUS	STATUS CODES		ACTIONS	SRV	SRV ERROR
AcqDB			● STARTED			▶ ■ ↺	0	0
HSMAdapter			● STARTED			▶ ■ ↺ ⋮	0	5 305
MC_CREDIT			● MALFUNCTION	DISCONN01	UNAVAIL01	▶ ■ ↺ ⋮	0	0
Platform			● STARTED			▶ ■ ↺ ⋮	0	0
WAY4DB			● STARTED			▶ ■ ↺ ⋮	1 330	0

1-5 of 5

Business = Services

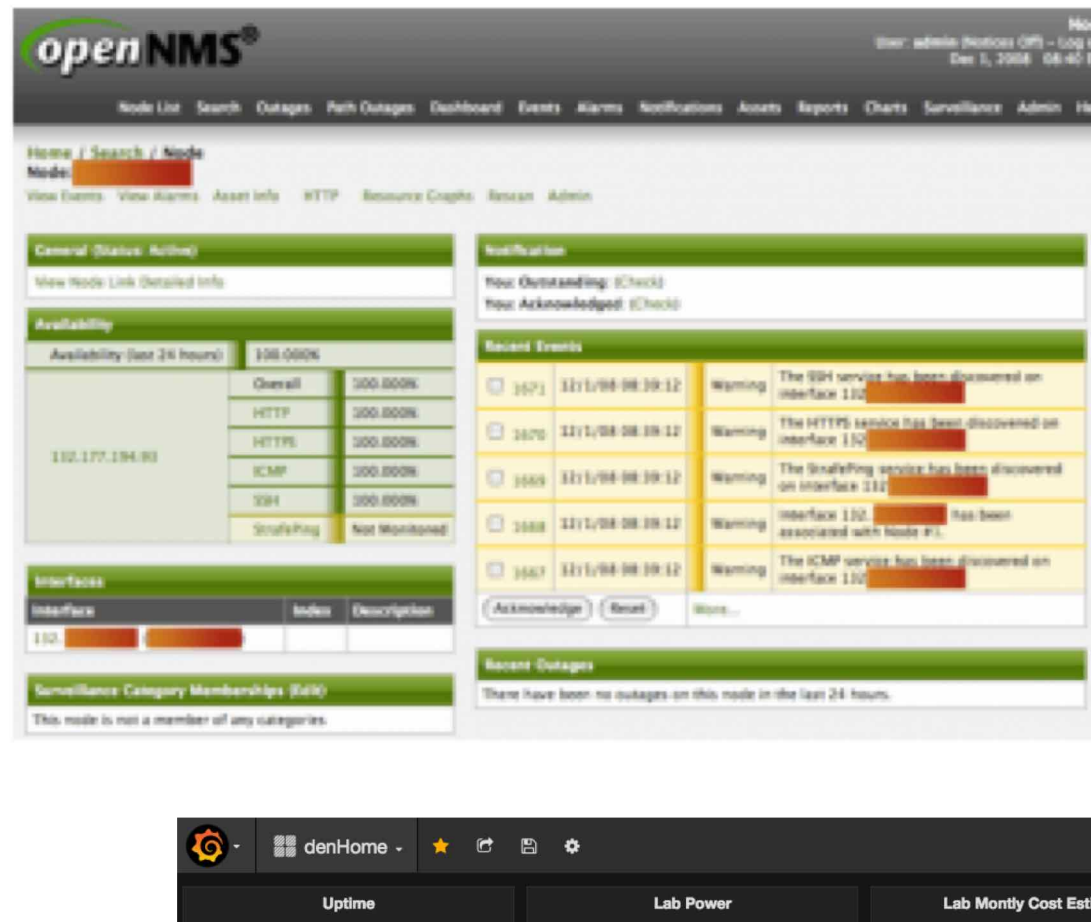
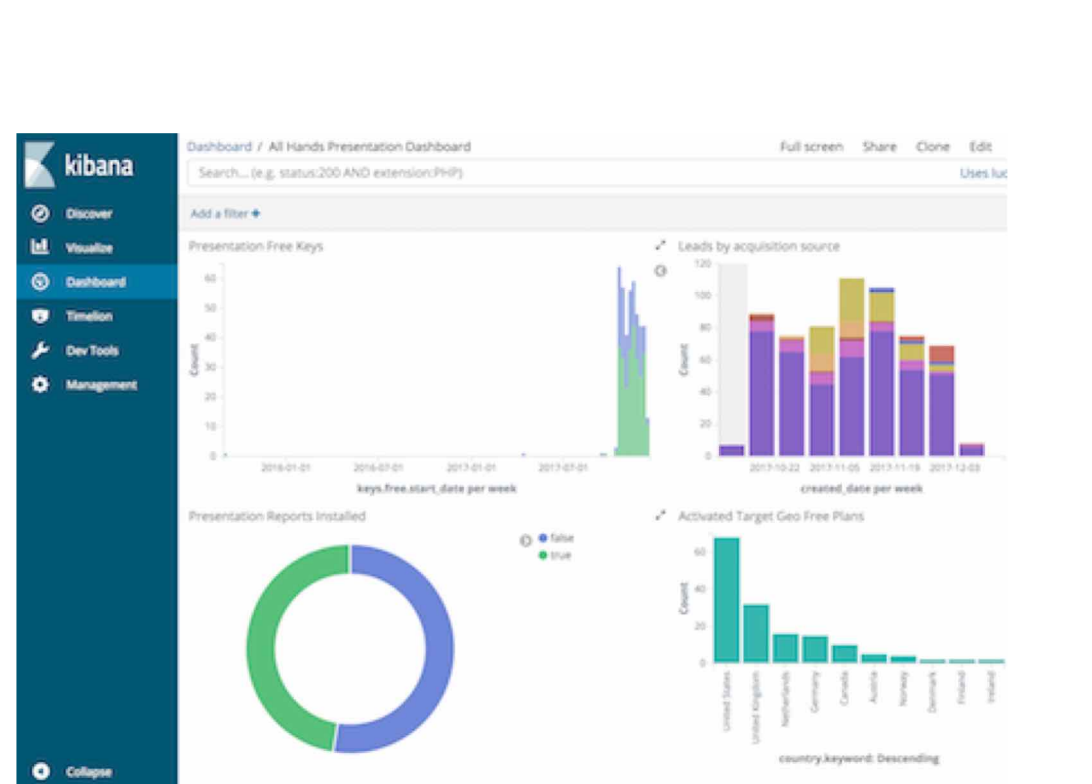
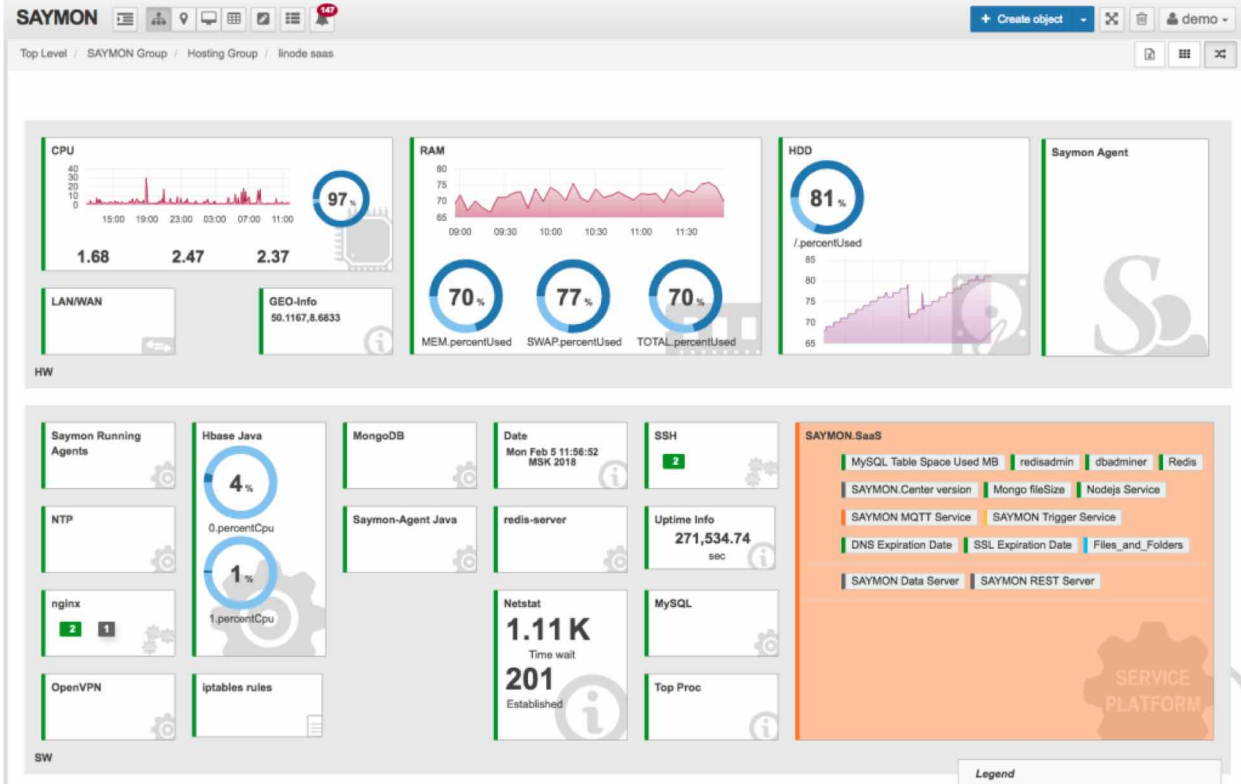
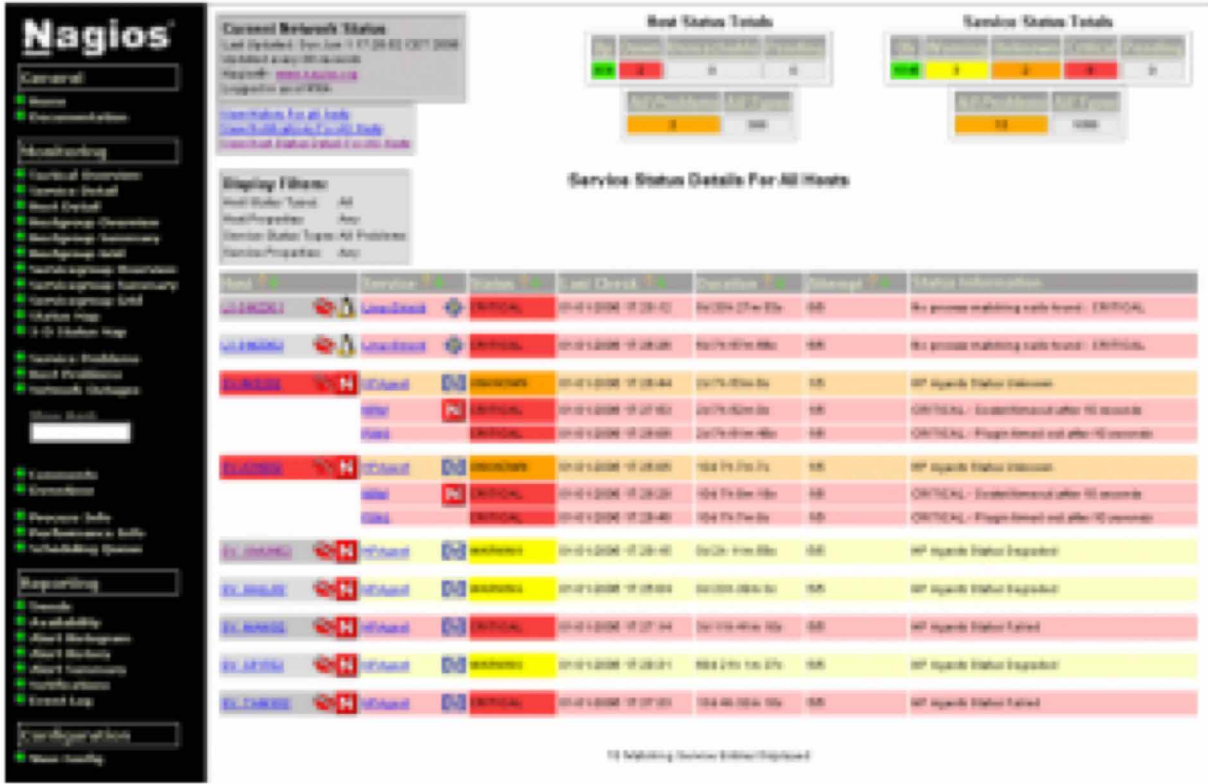


Aggregate them all: profit !

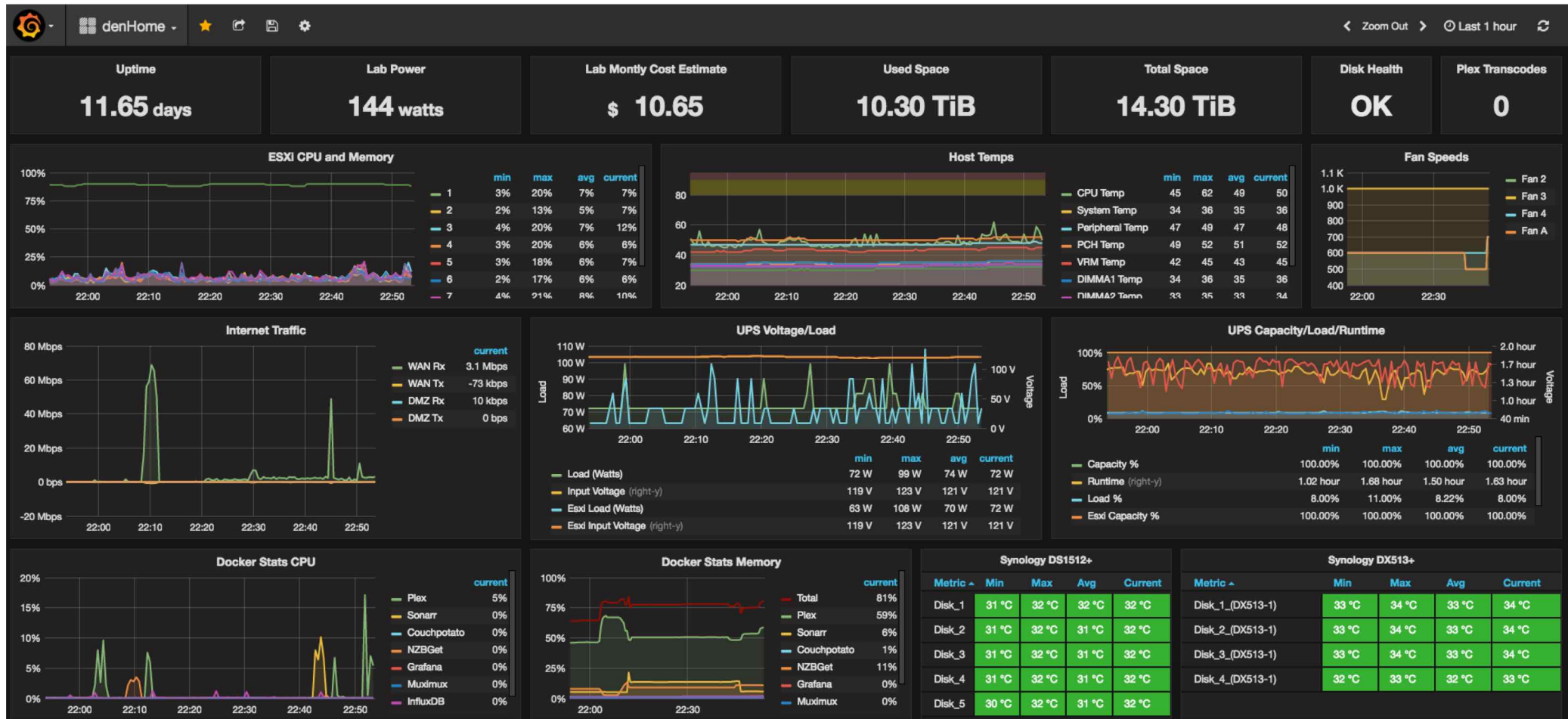
```
C:\WAY4ApplicationServer\appserver\applications\m_tools\commands>apps.cmd
```

Application	Server	State	MemoryUsed	StartedTime	Restarts	HttpPort
examples	192.168.1.100	STARTED	31.1m	16-05-17 13:26	0	14750
logagent	192.168.1.100	STOPPED			0	0
logagent	192.168.1.100	STOPPED			0	0
logagent	192.168.1.100	STARTED	41.7m	16-05-17 13:24	0	0
monitoring	192.168.1.100	STARTED	76.2m	16-05-17 13:24	0	0
trsw	192.168.1.100	STARTED	71.5m	16-05-17 13:25	0	10200

Cluster CLI profit 😊



Other way



Thank you!
Your way4

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