mesoform

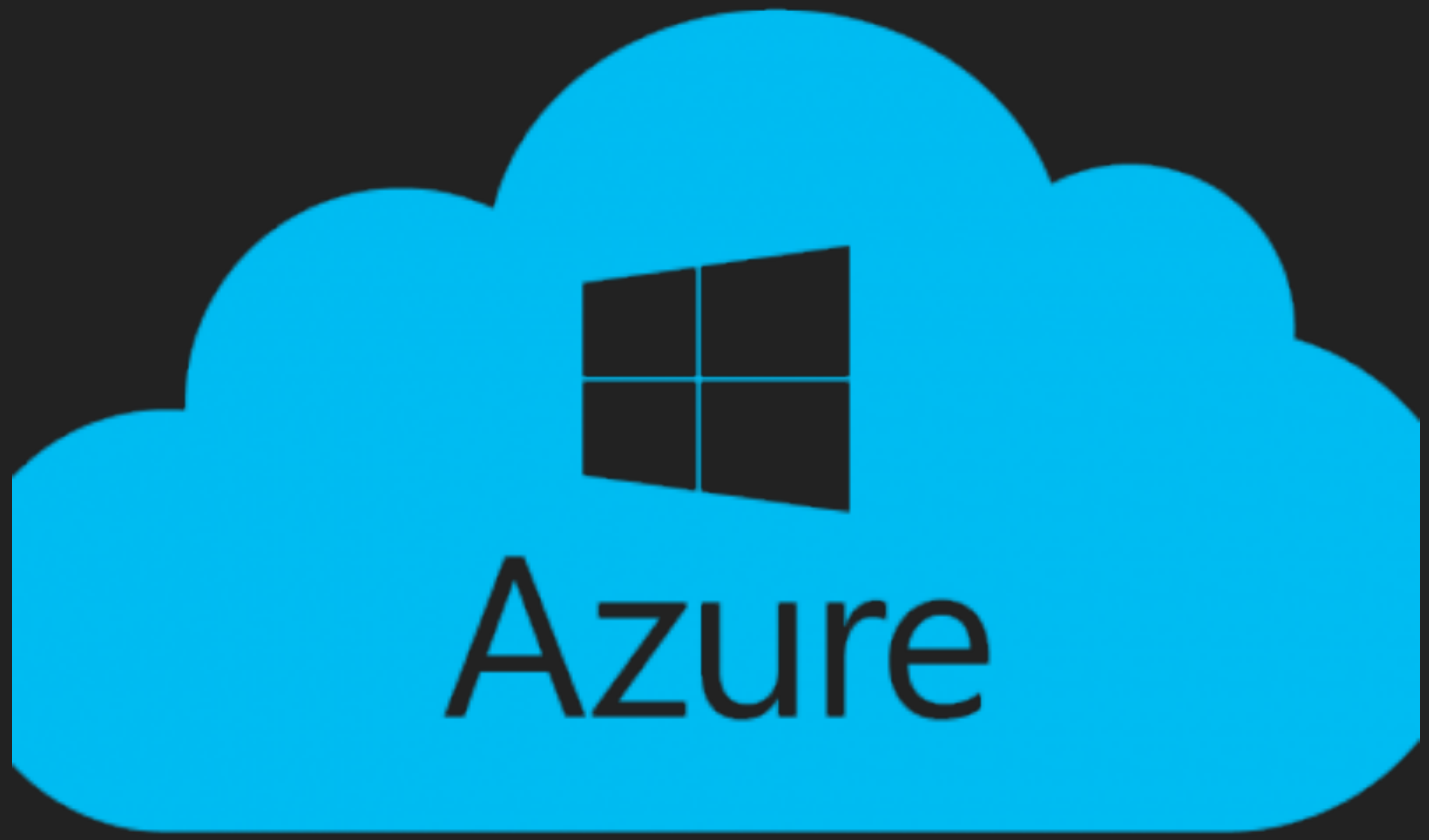
SIMPLIFYING CONTAINERS AT SCALE

THE CONCIERGE PARADIGM

YOUR CONCIERGE FOR THE EVENING

- Gareth Brown
- Director and technologist at Mesoform
- Specialise in securely simplifying and streamlining
- DevOps back in early '00s
- Was running containers in production many years ago
- Built a self-service VM infrastructure..

Google


Azure

amazon
web services™

HISTORY OF CONTAINERS

- 1979: chroot
- Jails, Zones, LXC (2000, 2004, 2008)
- Along comes AWS
- Docked back in

FLYING FISH

- Docker Engine in the Cloud
- Maintaining pets
- Monitoring
- Scheduling
- Auto-scaling
- Service discovery

Bravo

LAYER CAKE

- New technologies (Kubernetes, Mesos)
- Complex
- Integrating different workloads and IaaS
- Up-skilling and support
- Tight coupling and dependency
- Keep It Stupidly Simple

THEY SHOULD REMAKE "BACK TO THE FUTURE 2"
WHERE THERE ARE NO FLYING CARS
SOCIAL DEMENTIA
AND PEOPLE JUST STARE AT THEIR PHONES ALL
THE TIME GETTING OFFENDED AT EVERYTHING

FUTURE OF CONTAINERS

- Standardisation
- Portability
- Performance
- Simplified management
- Resource Utilisation
- Cost!

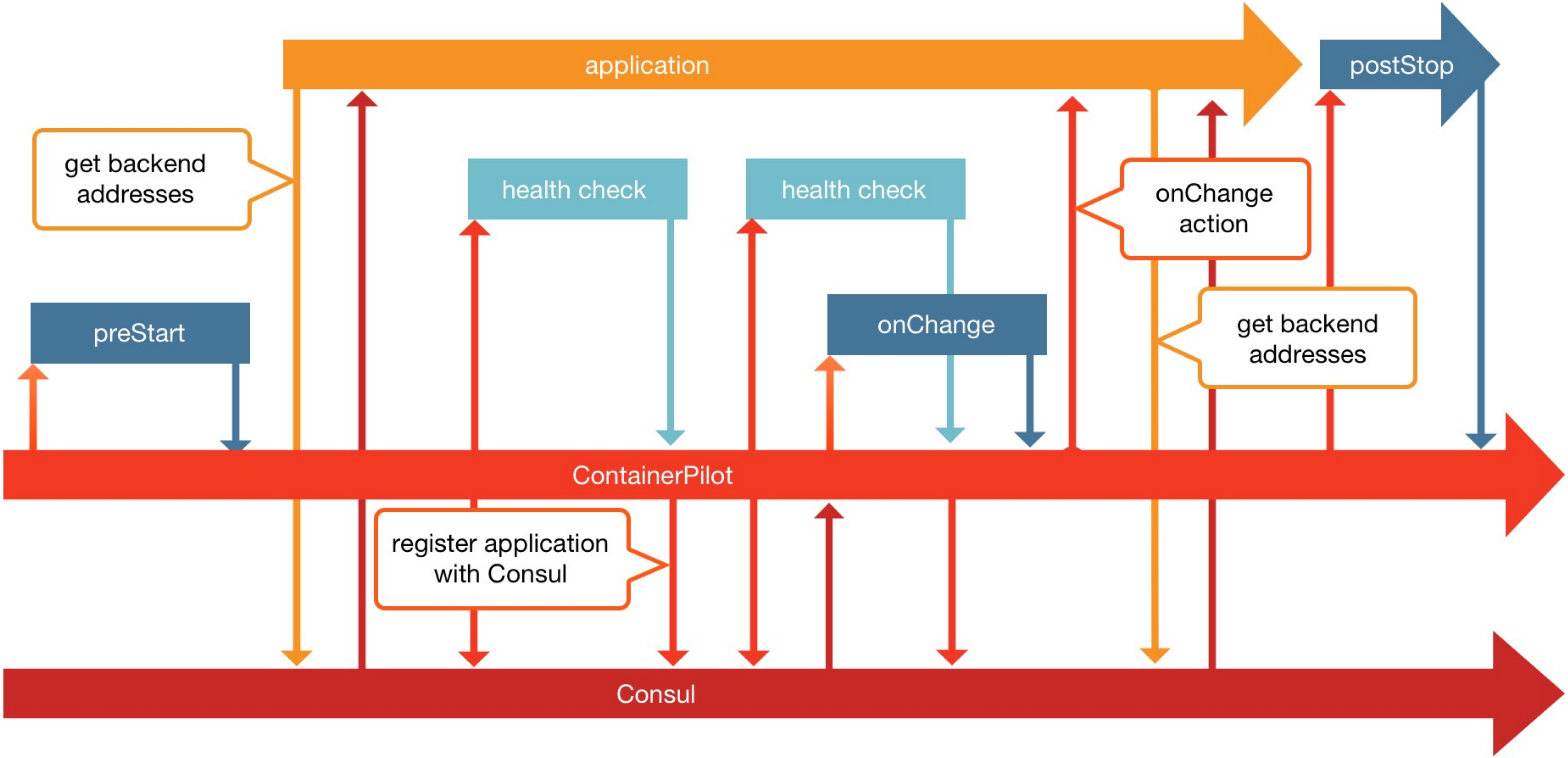
PUPPIES MAKE PAIN GO AWAY

OPERATING PAINS

- On-Premise, EC2, ECS, CoreOS, Kubernetes, other AWS services, Java, Python…
- Papertrail and Elastic Stack
- Zabbix and Librato
- Dropwizard with agents pulling from applications
- bumped all of the common issues
- Windowing and performance

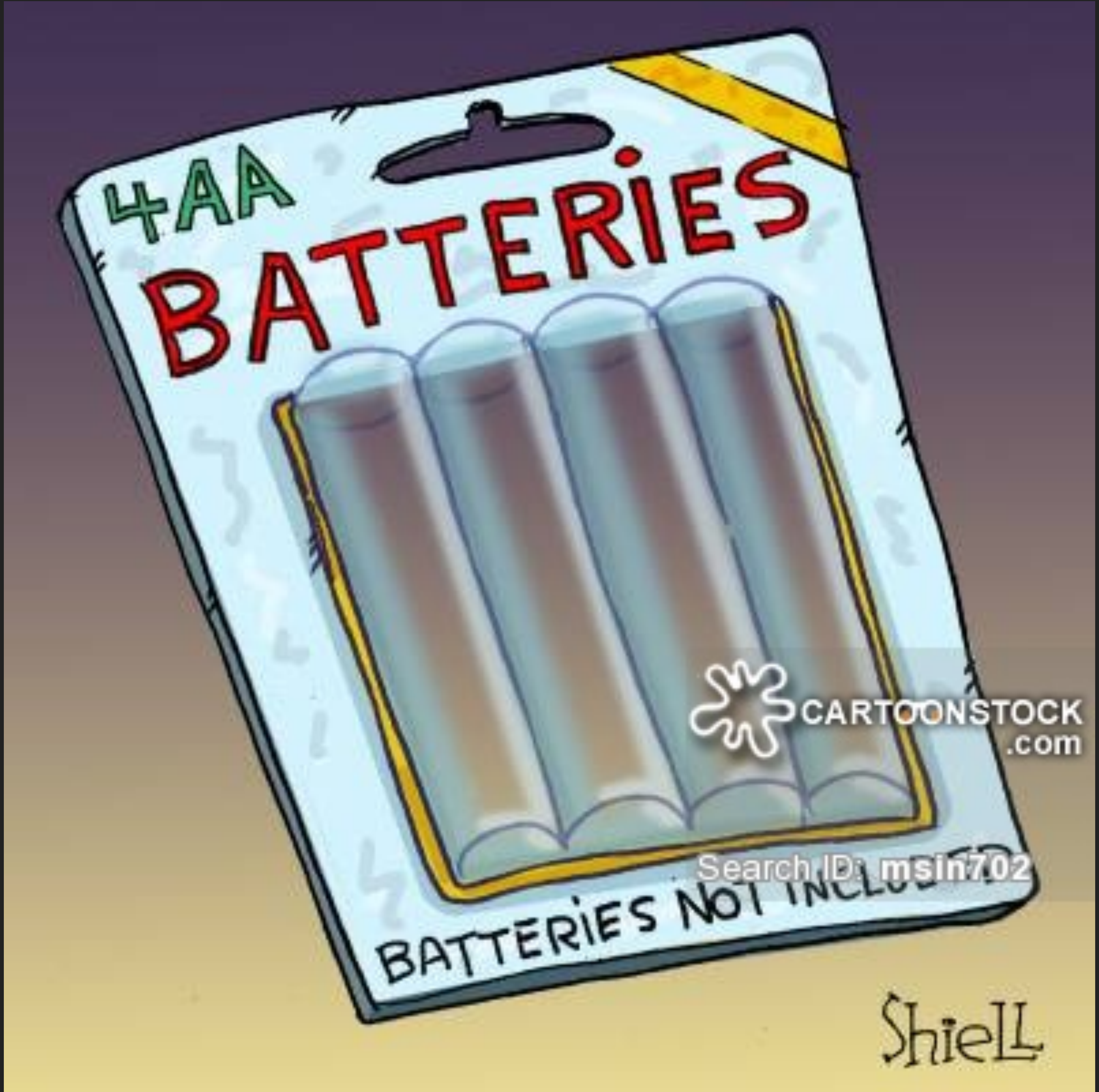
AUTOPILOT PATTERN

- No complex framework
- Service discovery
- Application orchestration
- Small piece of code to automate common actions


application
postStop
get backend addresses
health check
health check
onChange action
preStart
onChange
get backend addresses
ContainerPilot
register application with Consul
Consul

FLYING ON AUTOPILOT

- Scheduler agnostic
- Most things just work
- App-centric orchestration
- Drastically less management
- Production grade environment, test environment time
- Co-processes!


4AA
BATTERiES
BATTERiES NOT INCLUDED
Shiell

BATTERIES INCLUDED

- Loose-couple to well defined systems
- Automatically register our containers
- Automatically discover resources
- Self-healing or corrective actions
- Interact with legacy applications
- Compliance scanning

CONTAINERPILOT.JSON

```
"postStop": ["zabbix_sender",
  "-c", "/etc/coprocesses/zabbix/zabbix_agentd.conf",
  "--key", "container.state",
  "--value", "0"]
"tasks": [
  {
    "name": "scheduling_status",
    "command": ["zabbix_sender",
      "-c", "/etc/coprocesses/zabbix/zabbix_agentd.conf",
      "--key", "container.state",
      "--value", "1"],
    "frequency": "10000ms",
    "timeout": "3000ms"
  }
],
"coprocesses": [
  {
    "name": "zabbix_agent",
    "command": ["/usr/sbin/zabbix_agentd", "-fc", "/etc/coprocesses/zabbix/zabbix_agentd.conf"],
    "restarts": 3
  }
]
```

© Daniel Leal-Olivas / i-Images

PUSH VS PULL

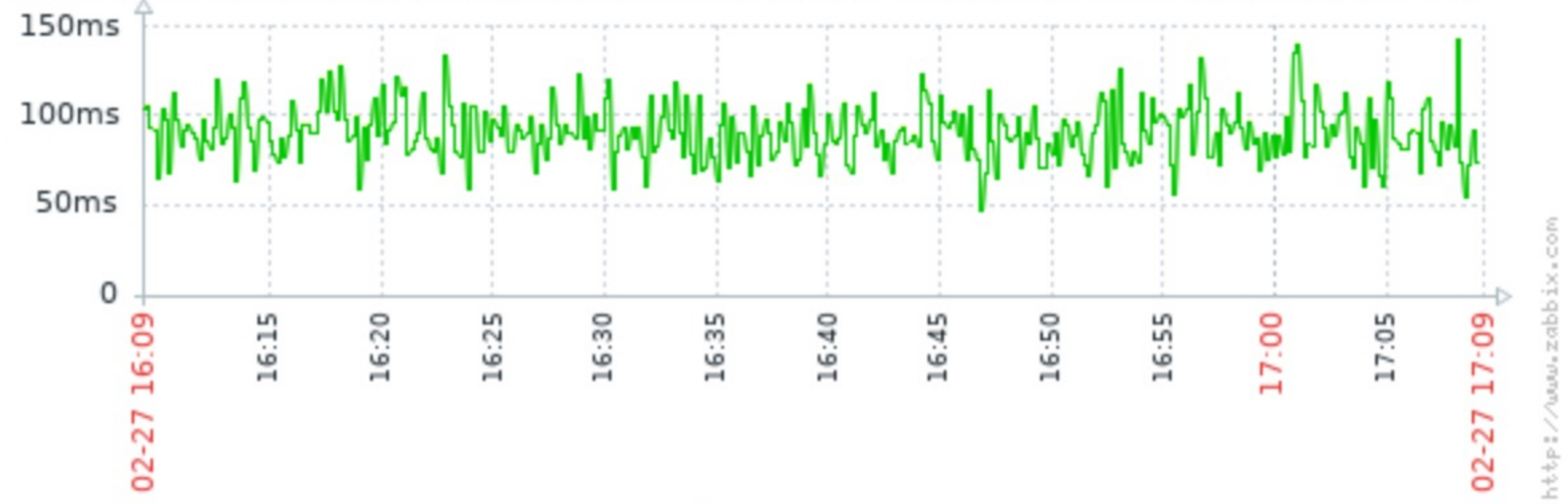
- Push method: auto-register but no confidence in instance state
- Pull method: centralised configuration but extra management
- Pull understands load and partitioning
- Windowing
- Processing poor performance
- Can we unify push and pull?

中和池
桑拿 冲浪 休闲
中和池浴室

THE CONCIERGE COURIER

- Two purposes (discovery, delivery)
- Learns metrics
- Picks up metrics
- Delivers them
- Records delivery
- Performance?

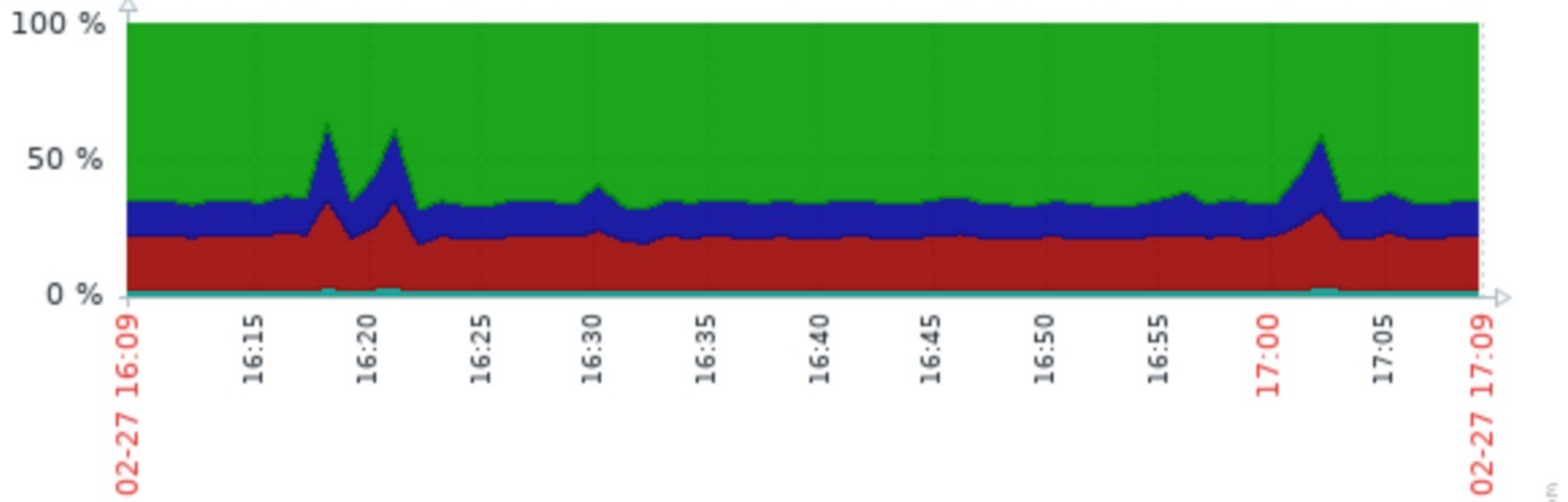
6fb01f66ca56.consul.dockerlx.oaas.mesoform.com: Consul::metrics:collect::timers (1h)



			last	min	avg	max
🟩	Consul::metrics:collect::timers	[all]	73.3ms	45.9ms	90.2ms	142.1ms

Data from history. Generated in 5.05 sec.

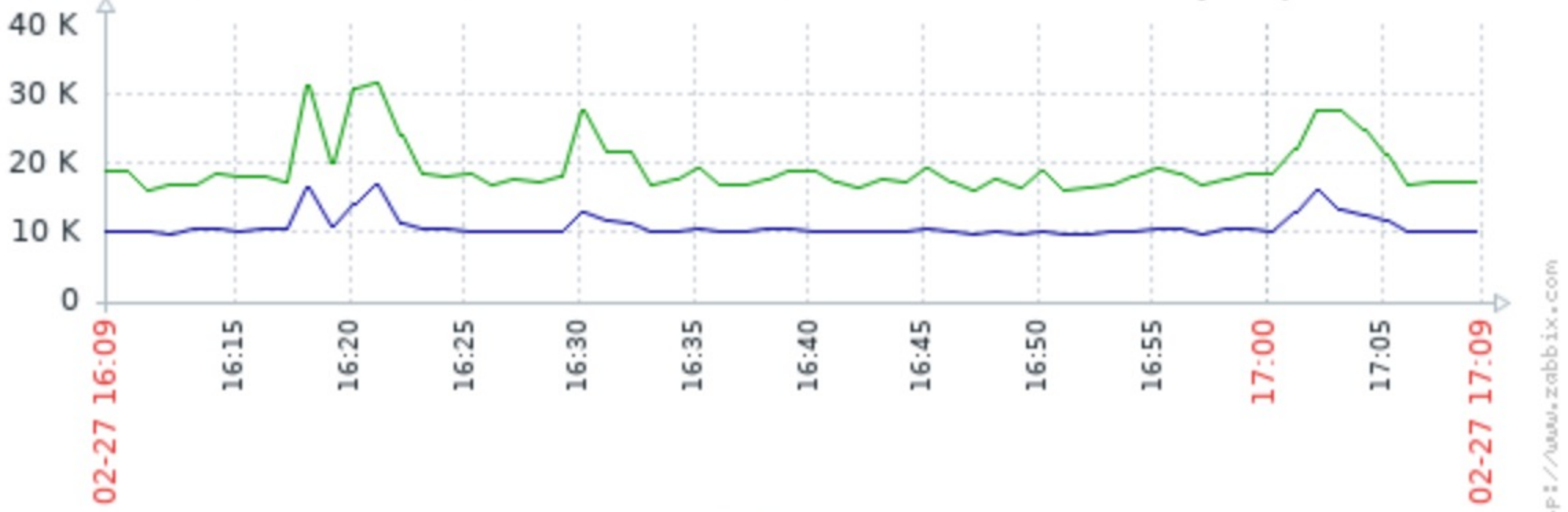
6fb01f66ca56.consul.dockerlx.oaas.mesoform.com: CPU utilization (1h)



			last	min	avg	max
🟩	CPU idle time	[avg]	65.58 %	37.31 %	64.13 %	68.86 %
🟦	CPU user time	[avg]	12.99 %	11.59 %	14.06 %	27.7 %
🟥	CPU system time	[avg]	19.84 %	16.51 %	20.16 %	32.81 %
🟨	CPU iowait time	[avg]	0 %	0 %	0 %	0 %
🟪	CPU nice time	[avg]	0 %	0 %	0 %	0 %
🟦	CPU interrupt time	[avg]	1.59 %	1.51 %	1.65 %	2.18 %
🟩	CPU softirq time	[avg]	0 %	0 %	0 %	0 %
🟥	CPU steal time	[avg]	0 %	0 %	0 %	0 %

Data from history. Generated in 6.73 sec.

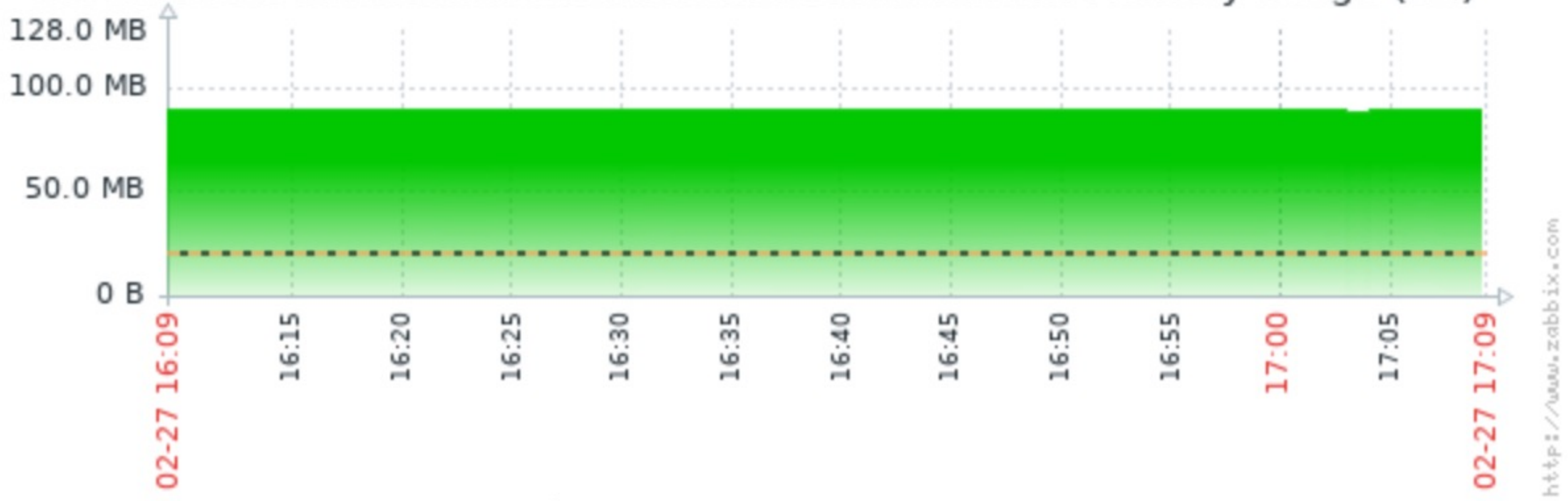
6fb01f66ca56.consul.dockerlx.oaas.mesoform.com: CPU jumps (1h)



			last	min	avg	max
🟩	Context switches per second	[avg]	17.28 Ksps	15.84 Ksps	19.3 Ksps	31.45 Ksps
🟦	Interrupts per second	[avg]	10.06 Kips	9.55 Kips	10.73 Kips	16.74 Kips

Data from history. Generated in 2.22 sec.

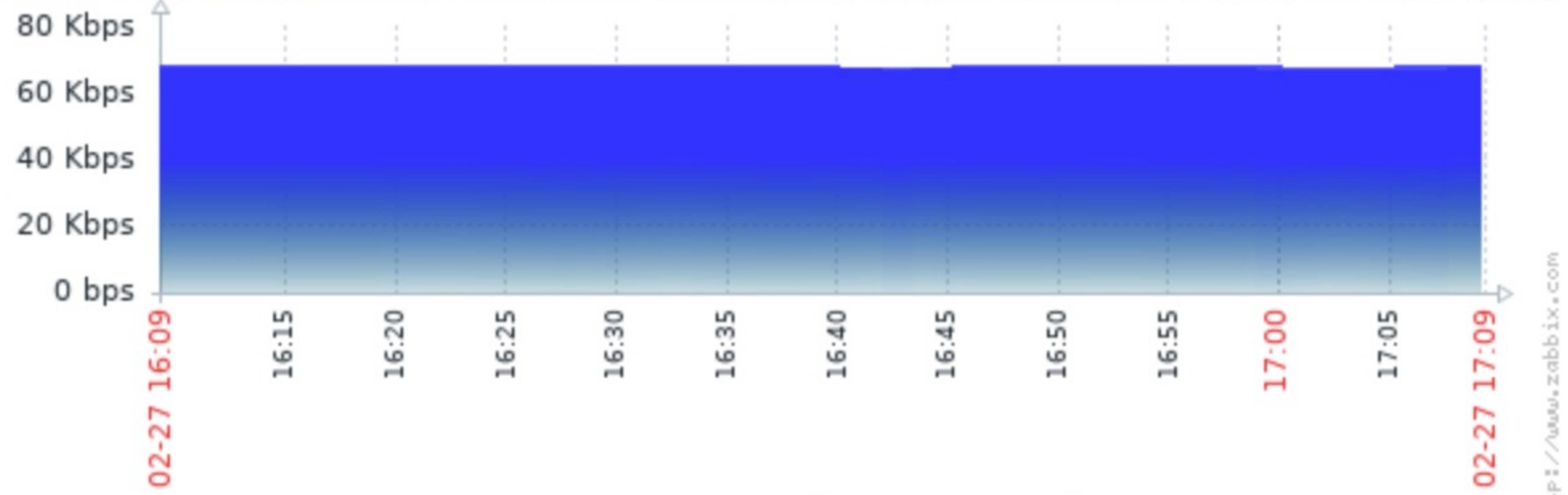
6fb01f66ca56.consul.dockerlx.oaas.mesoform.com: Memory usage (1h)



			last	min	avg	max
🟩	Available memory	[avg]	87.55 MB	86.2 MB	87.41 MB	87.59 MB

Data from history. Generated in 3.35 sec.

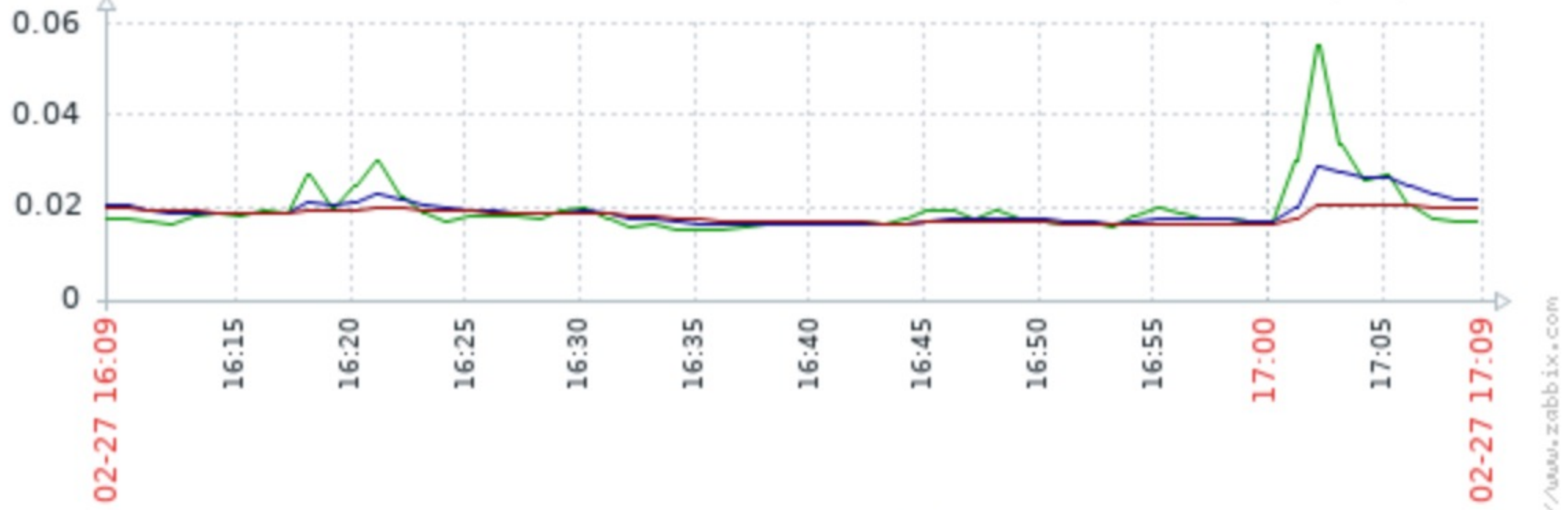
6fb01f66ca56.consul.dockerlx.oaas.mesoform.com: Network traffic on eth0 (1h)



			last	min	avg	ma
🟩	Incoming network traffic on eth0	[avg]	38.05 Kbps	37.62 Kbps	37.91 Kbps	38.15
🟦	Outgoing network traffic on eth0	[avg]	66.42 Kbps	65.69 Kbps	66.45 Kbps	66.71

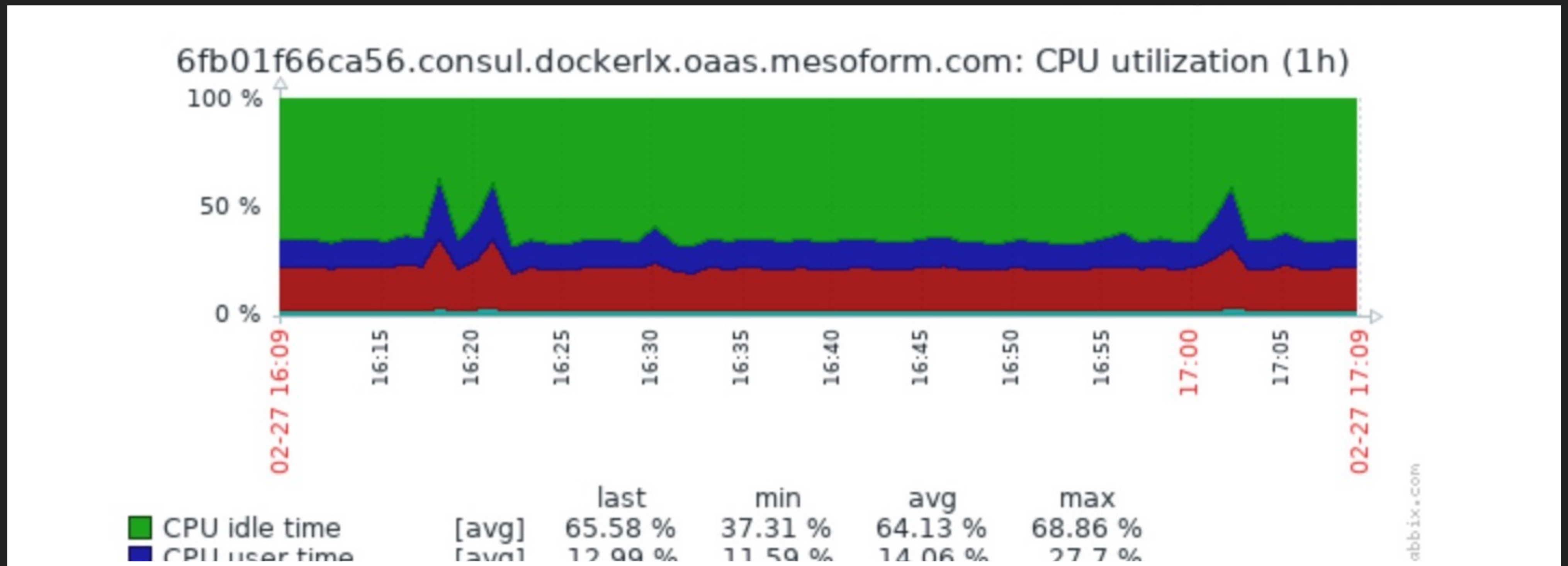
Data from history. Generated in 4.16 sec.

6fb01f66ca56.consul.dockerlx.oaas.mesoform.com: CPU load (1h)



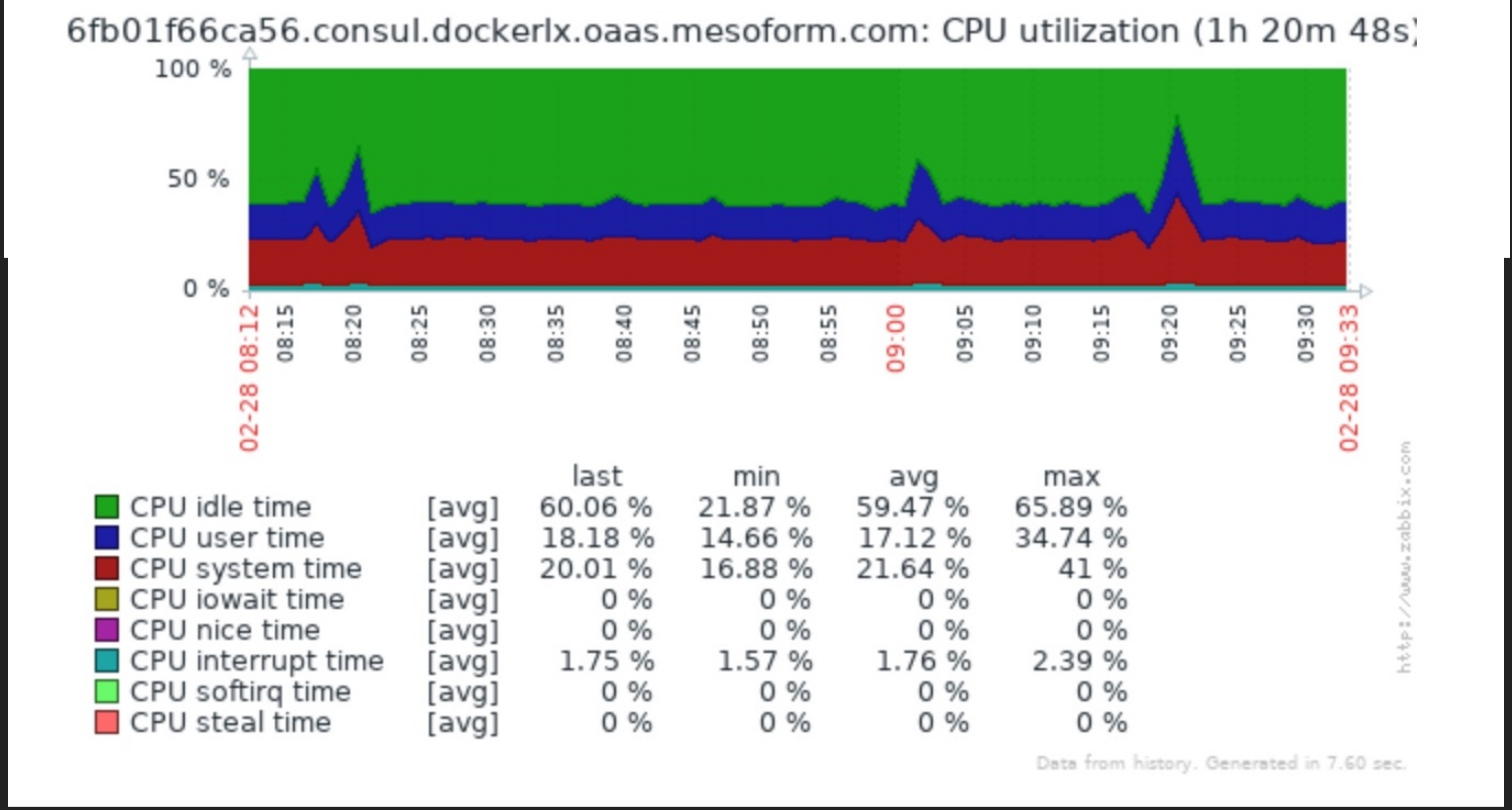
			last	min	avg	max
🟩	Processor load (1 min average per core)	[avg]	0.017	0.0148	0.0195	0.055
🟦	Processor load (5 min average per core)	[avg]	0.0217	0.0161	0.019	0.029
🟥	Processor load (15 min average per core)	[avg]	0.0197	0.0162	0.018	0.0207

CPU UTILISATION



6fb01f66ca56.consul.dockerlx.oaas.mesoform.com: CPU utilization (1h)

			last	min	avg	max
🟩	CPU idle time	[avg]	65.58 %	37.31 %	64.13 %	68.86 %
🟦	CPU user time	[avg]	12.99 %	11.59 %	14.06 %	27.7 %

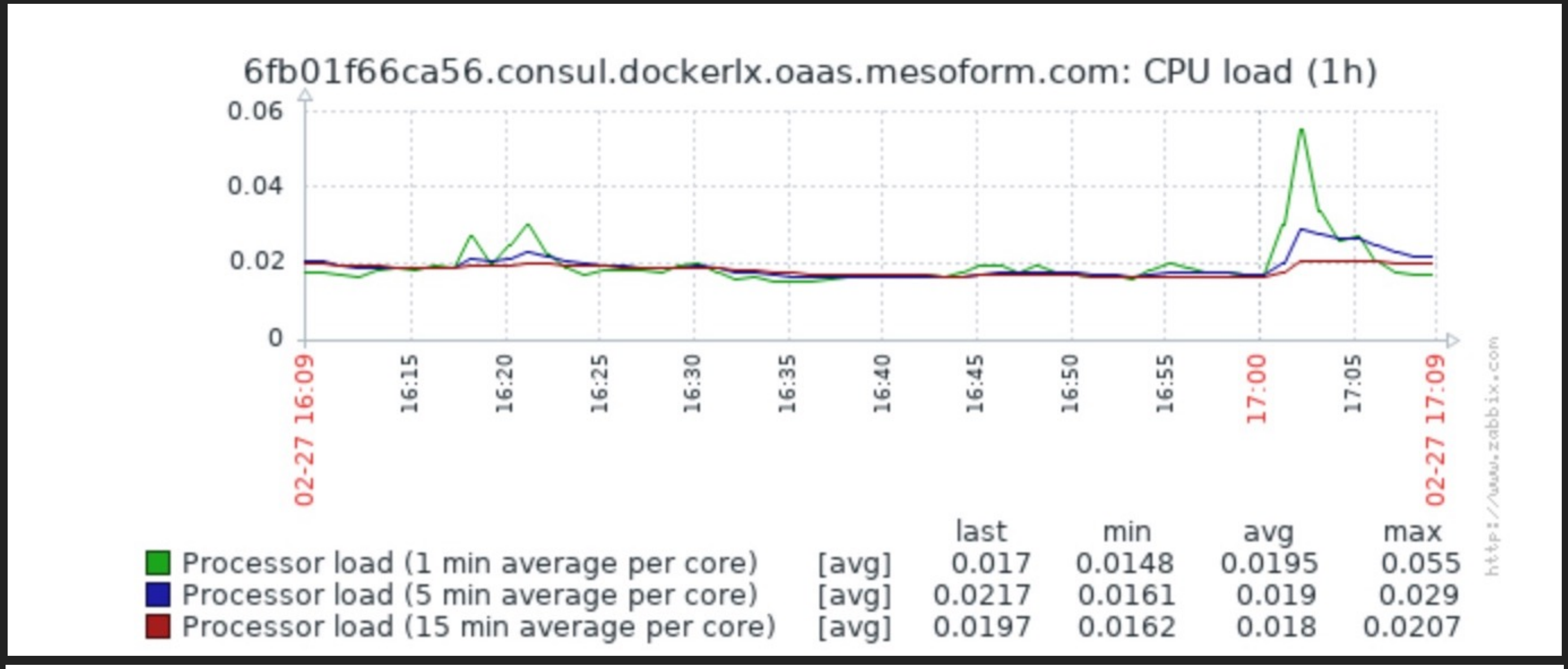


6fb01f66ca56.consul.dockerlx.oaas.mesoform.com: CPU utilization (1h 20m 48s)

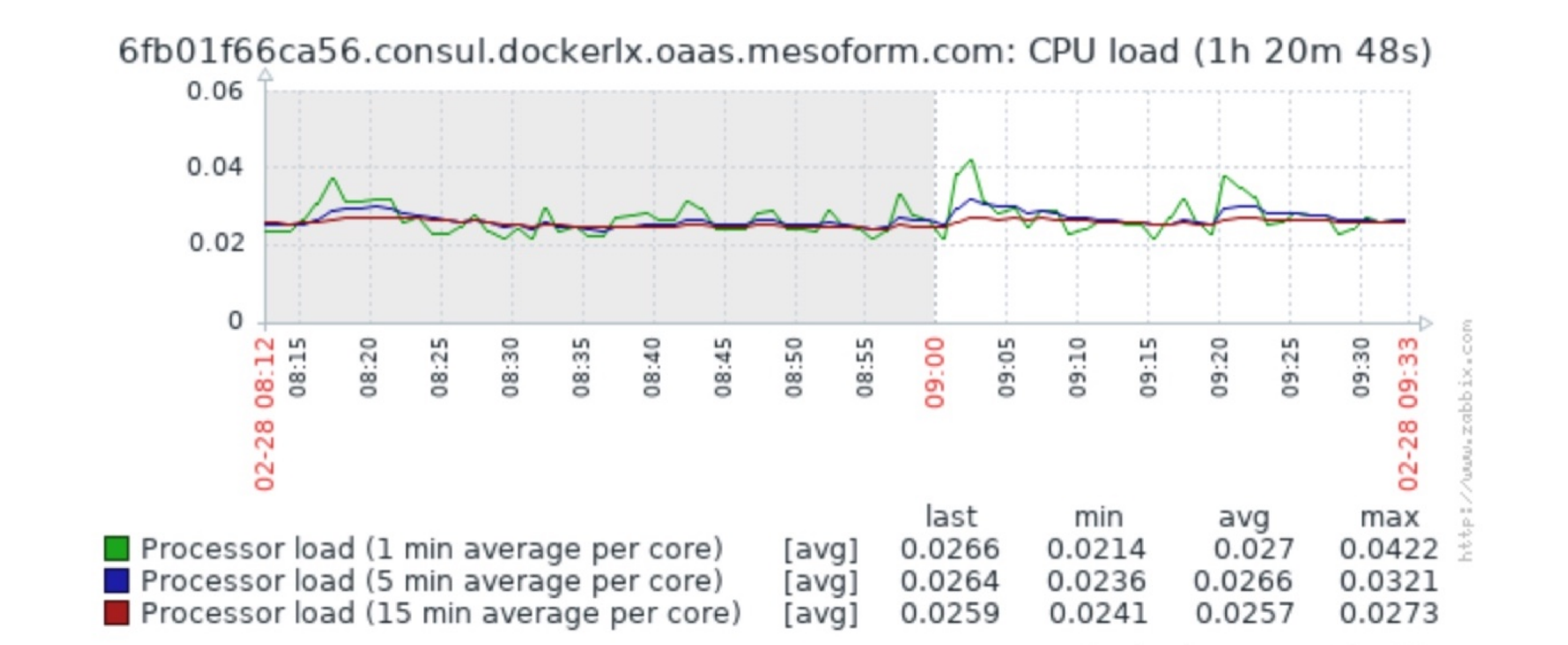
			last	min	avg	max
🟩	CPU idle time	[avg]	60.06 %	21.87 %	59.47 %	65.89 %
🟦	CPU user time	[avg]	18.18 %	14.66 %	17.12 %	34.74 %
🟥	CPU system time	[avg]	20.01 %	16.88 %	21.64 %	41 %
🟨	CPU iowait time	[avg]	0 %	0 %	0 %	0 %
🟪	CPU nice time	[avg]	0 %	0 %	0 %	0 %
▨	CPU interrupt time	[avg]	1.75 %	1.57 %	1.76 %	2.39 %
🟩	CPU softirq time	[avg]	0 %	0 %	0 %	0 %
🟥	CPU steal time	[avg]	0 %	0 %	0 %	0 %

Data from history. Generated in 7.60 sec.

LOAD

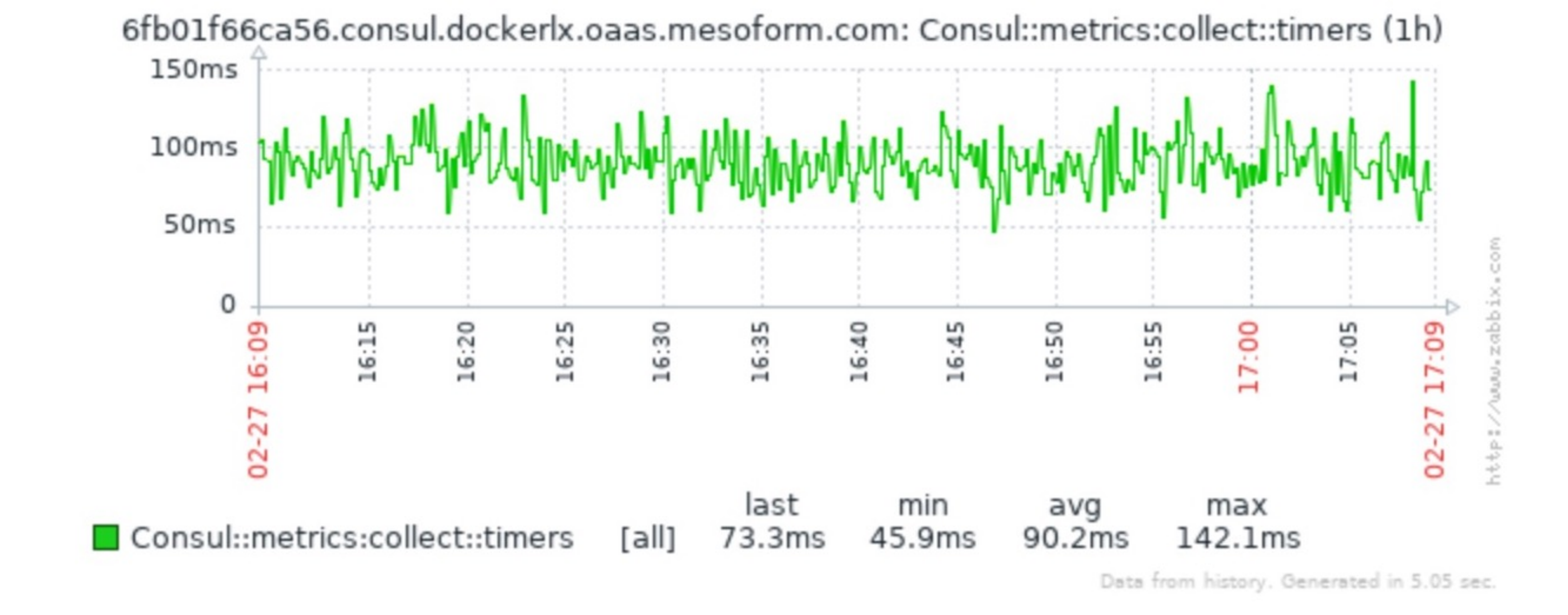

6fb01f66ca56.consul.dockerlx.oaas.mesoform.com: CPU load (1h)

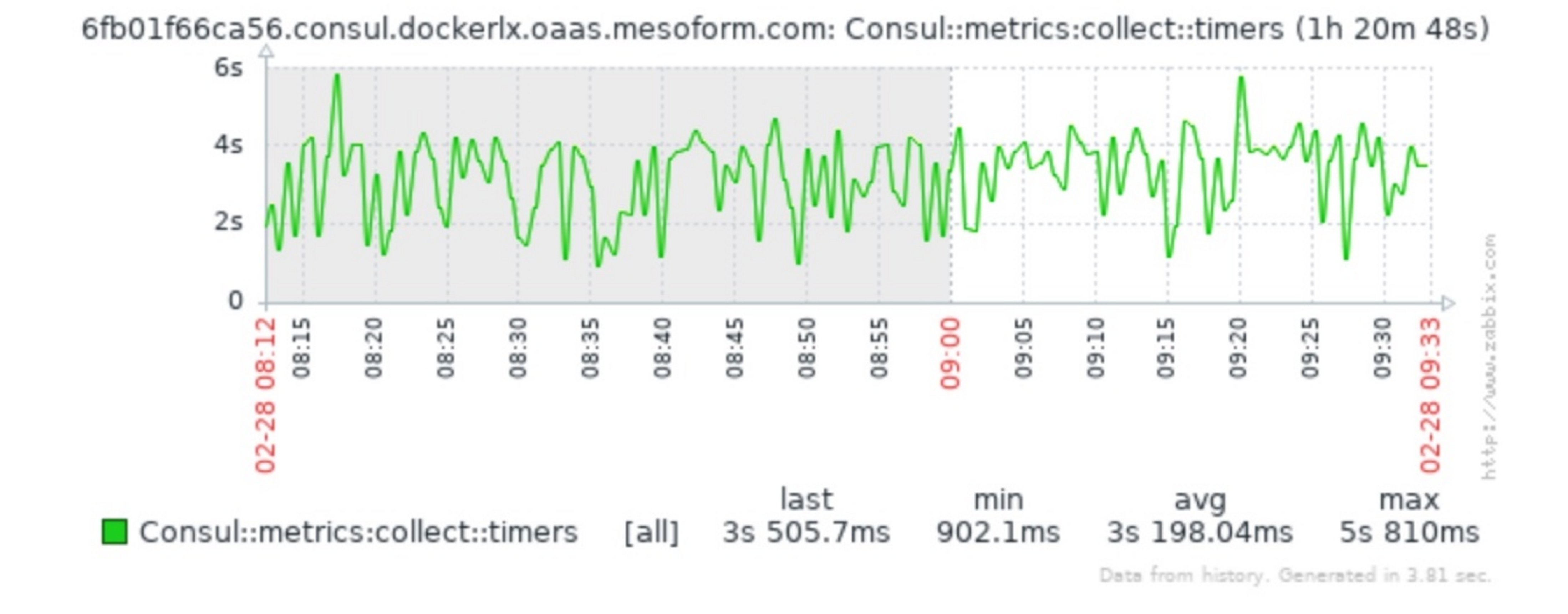
		last	min	avg	max
🟩 Processor load (1 min average per core)	[avg]	0.017	0.0148	0.0195	0.055
🟦 Processor load (5 min average per core)	[avg]	0.0217	0.0161	0.019	0.029
🟥 Processor load (15 min average per core)	[avg]	0.0197	0.0162	0.018	0.0207

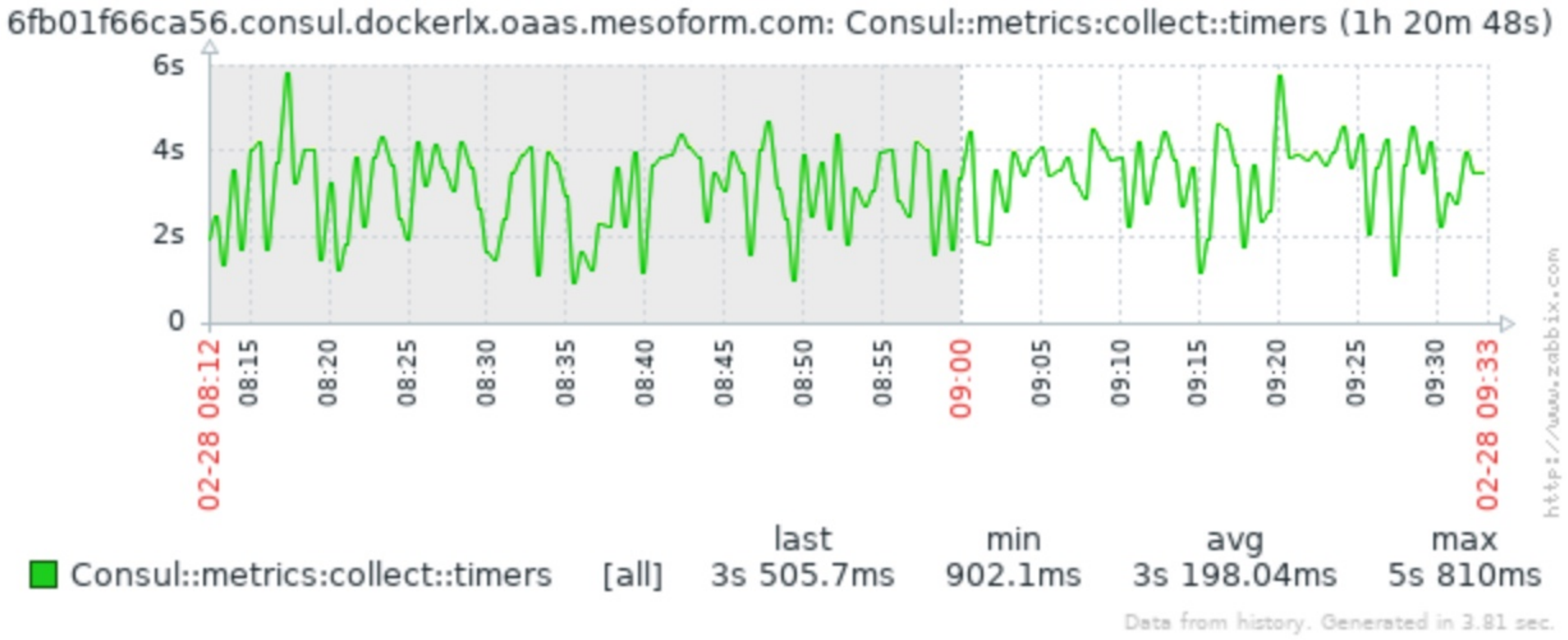

6fb01f66ca56.consul.dockerlx.oaas.mesoform.com: CPU load (1h 20m 48s)

		last	min	avg	max
🟩 Processor load (1 min average per core)	[avg]	0.0266	0.0214	0.027	0.0422
🟦 Processor load (5 min average per core)	[avg]	0.0264	0.0236	0.0266	0.0321
🟥 Processor load (15 min average per core)	[avg]	0.0259	0.0241	0.0257	0.0273

TIMING

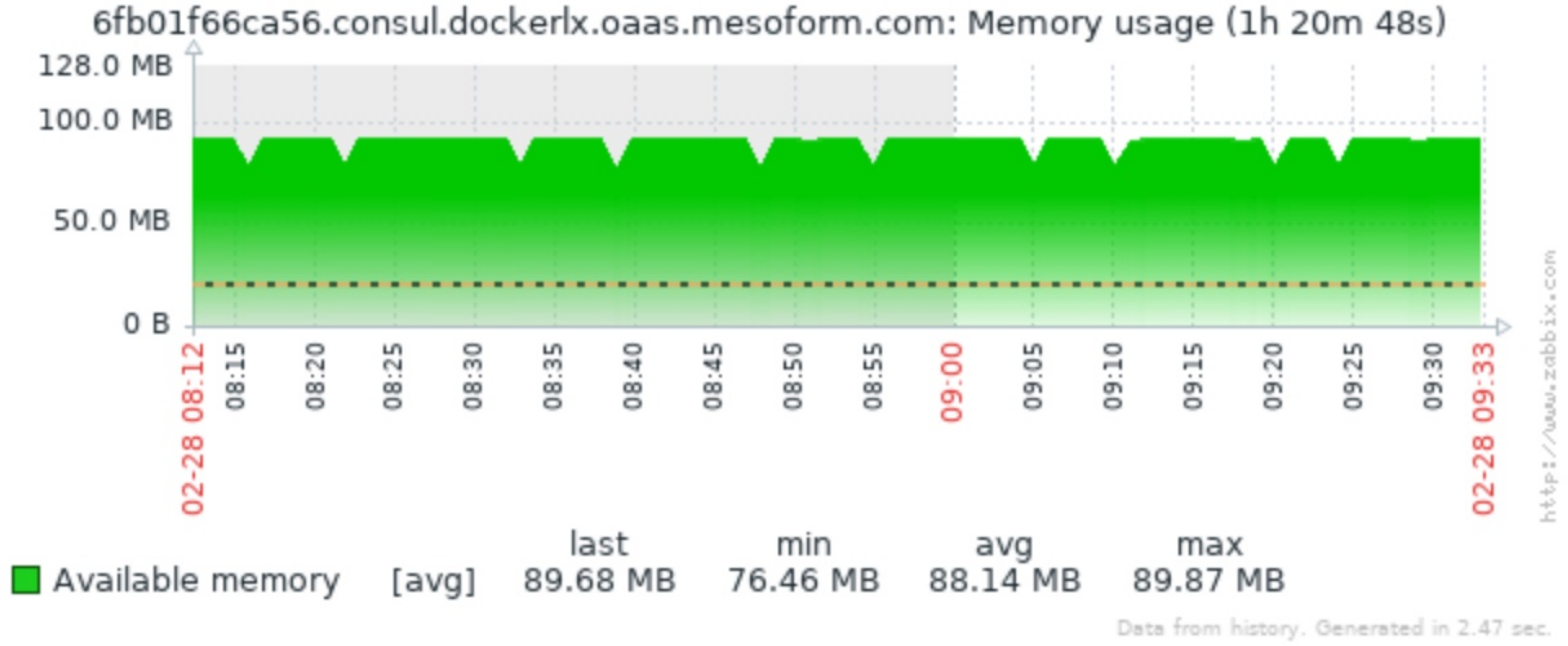

6fb01f66ca56.consul.dockerlx.oaas.mesoform.com: Consul::metrics:collect::timers (1h)
150ms
100ms
50ms
0
02-27 16:09
16:15
16:20
16:25
16:30
16:35
16:40
16:45
16:50
16:55
17:00
17:05
02-27 17:09
http://www.zabbix.com
last
min
avg
max
🟩 Consul::metrics:collect::timers
[all]
73.3ms
45.9ms
90.2ms
142.1ms
Data from history. Generated in 5.05 sec.


6fb01f66ca56.consul.dockerlx.oaas.mesoform.com: Consul::metrics:collect::timers (1h 20m 48s)
6s
4s
2s
0
02-28 08:12
08:15
08:20
08:25
08:30
08:35
08:40
08:45
08:50
08:55
09:00
09:05
09:10
09:15
09:20
09:25
09:30
02-28 09:33
http://www.zabbix.com
last
min
avg
max
🟩 Consul::metrics:collect::timers
[all]
3s 505.7ms
902.1ms
3s 198.04ms
5s 810ms
Data from history. Generated in 3.81 sec.



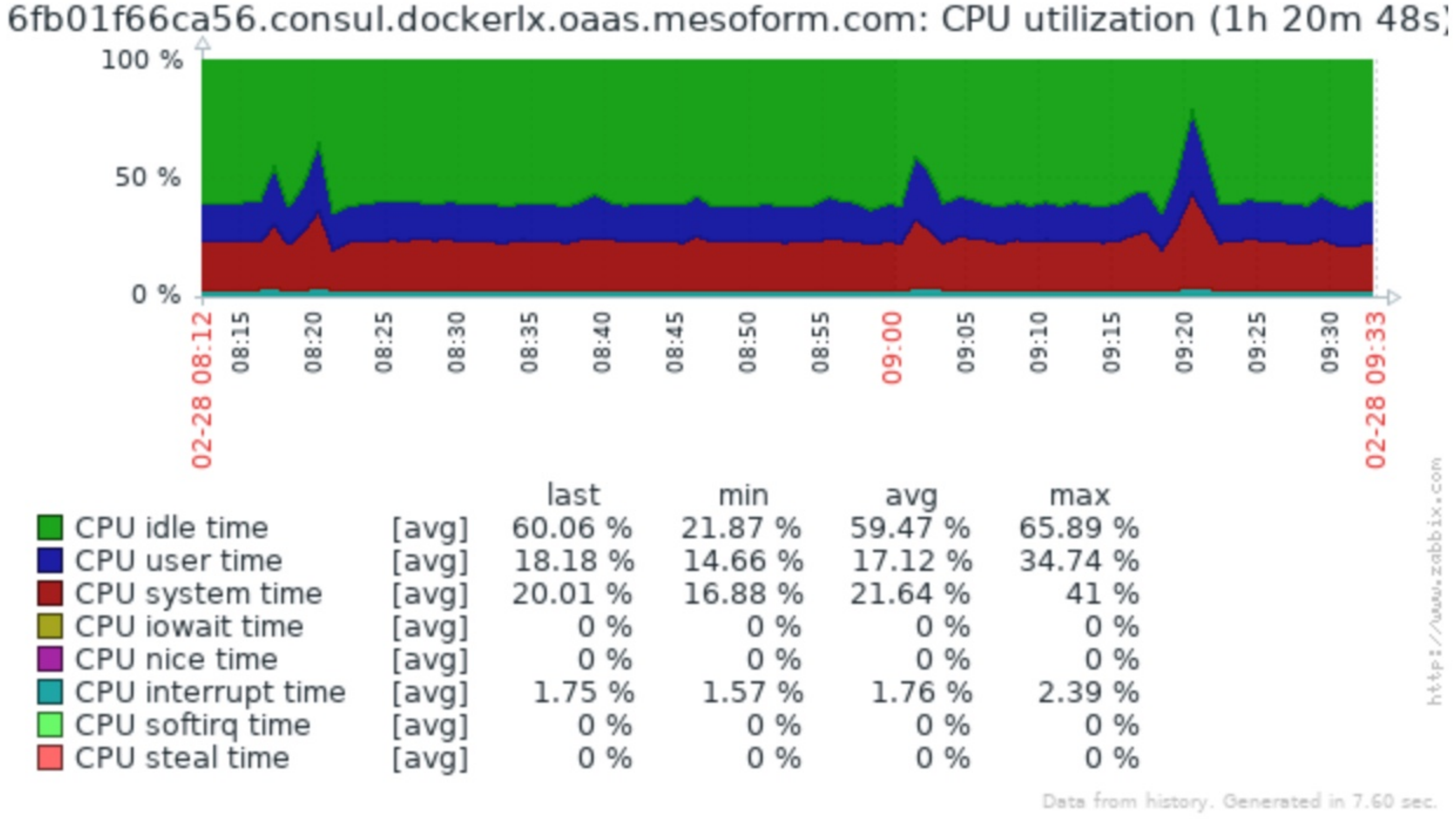
		last	min	avg	max
🟩 Consul::metrics:collect::timers	[all]	3s 505.7ms	902.1ms	3s 198.04ms	5s 810ms

Data from history. Generated in 3.81 sec.



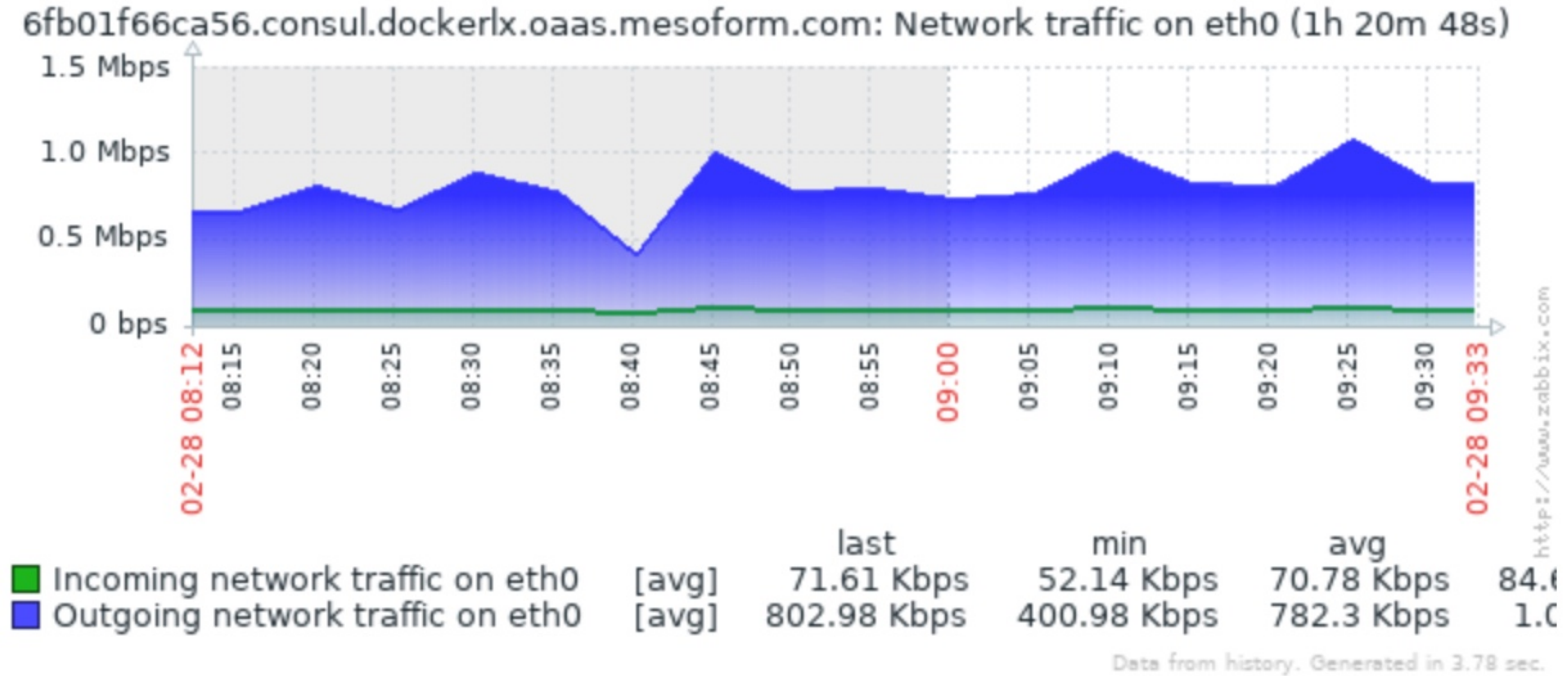
		last	min	avg	max
🟩 Available memory	[avg]	89.68 MB	76.46 MB	88.14 MB	89.87 MB

Data from history. Generated in 2.47 sec.



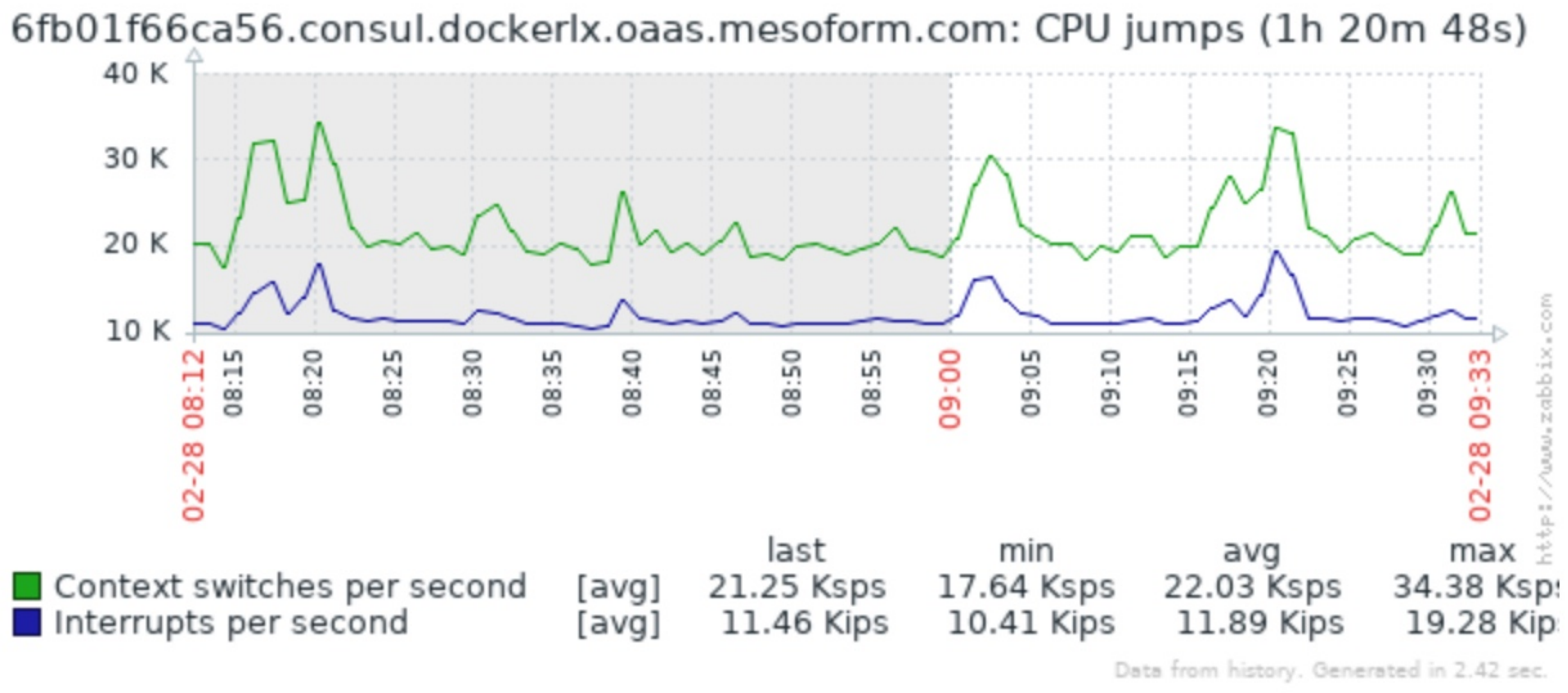
		last	min	avg	max
🟩 CPU idle time	[avg]	60.06 %	21.87 %	59.47 %	65.89 %
🟦 CPU user time	[avg]	18.18 %	14.66 %	17.12 %	34.74 %
🟥 CPU system time	[avg]	20.01 %	16.88 %	21.64 %	41 %
🟨 CPU iowait time	[avg]	0 %	0 %	0 %	0 %
🟪 CPU nice time	[avg]	0 %	0 %	0 %	0 %
🟦 CPU interrupt time	[avg]	1.75 %	1.57 %	1.76 %	2.39 %
🟩 CPU softirq time	[avg]	0 %	0 %	0 %	0 %
🟥 CPU steal time	[avg]	0 %	0 %	0 %	0 %

Data from history. Generated in 7.60 sec.



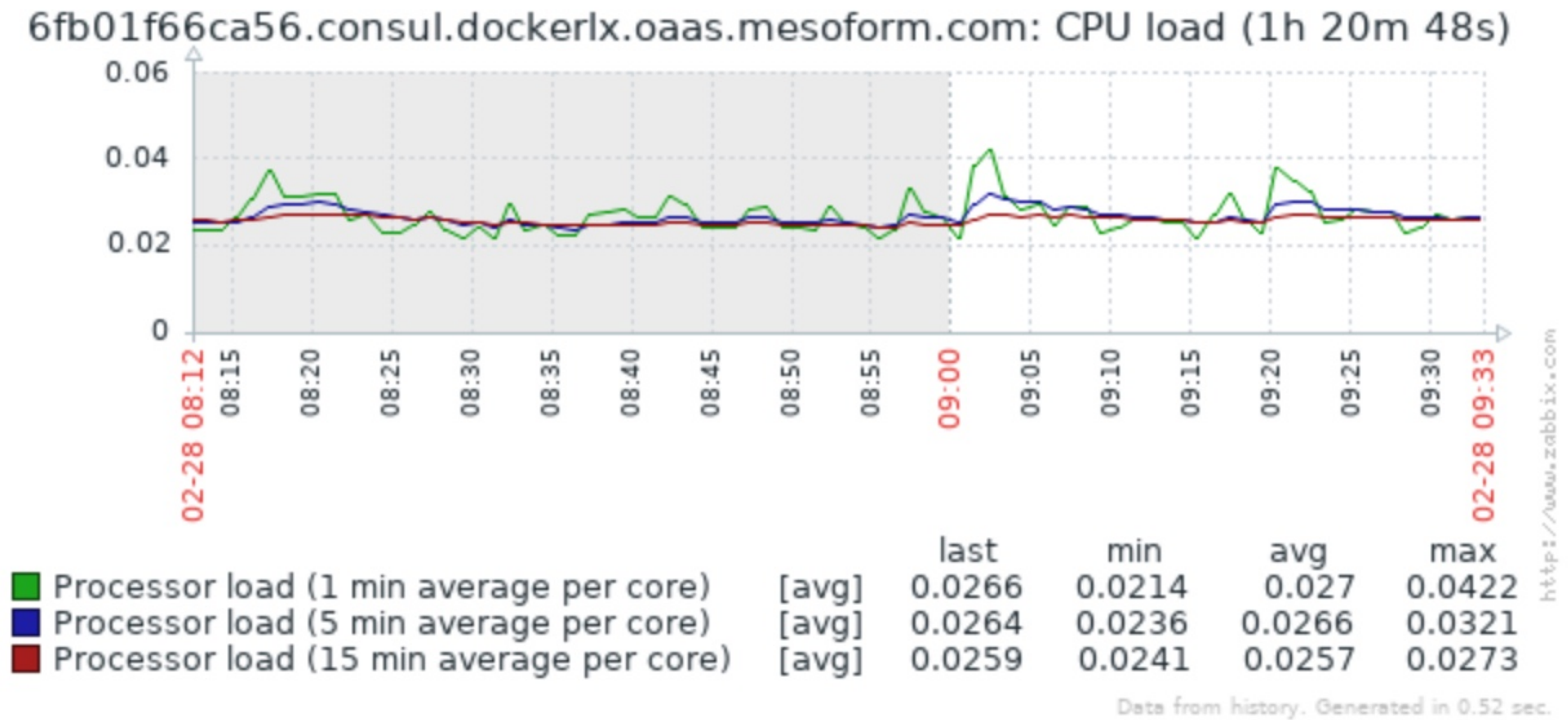
		last	min	avg	
🟩 Incoming network traffic on eth0	[avg]	71.61 Kbps	52.14 Kbps	70.78 Kbps	84.(
🟦 Outgoing network traffic on eth0	[avg]	802.98 Kbps	400.98 Kbps	782.3 Kbps	1.(

Data from history. Generated in 3.78 sec.



		last	min	avg	max
🟩 Context switches per second	[avg]	21.25 Ksps	17.64 Ksps	22.03 Ksps	34.38 Ksp:
🟦 Interrupts per second	[avg]	11.46 Kips	10.41 Kips	11.89 Kips	19.28 Kip:

Data from history. Generated in 2.42 sec.



		last	min	avg	max
🟩 Processor load (1 min average per core)	[avg]	0.0266	0.0214	0.027	0.0422
🟦 Processor load (5 min average per core)	[avg]	0.0264	0.0236	0.0266	0.0321
🟥 Processor load (15 min average per core)	[avg]	0.0259	0.0241	0.0257	0.0273

Data from history. Generated in 0.52 sec.

THE CONCIERGE COURIER

- 3rd party features
- No windowing
- High Performance
- Send to anywhere
- Pull from anywhere
- Monitoring system agnostic

CONCIERGE_COURIER.PY

```
def discover_timers():
    """
    Output Zabbix formatted JSON of keys
    """
    # just for testing purposes, simply open a file with metrics
    with open("/tmp/metrics.json", "r") as metrics_file:
        keys = metrics_file.read()
        keys_json = json.loads(keys)

        discovery_data_dict = \
            {'data': [{"{#TIMER}": key} for key in keys_json['timers']]}
        print(json.dumps(discovery_data_dict))
```

CONCIERGE_COURIER.PY

```
def get_timers():
    with open("/tmp/metrics.json", "r") as metrics_file:
        keys = metrics_file.read()
        keys = json.loads(keys)
        with open("/tmp/timer_metrics_zabbix.sender", "w") as sender_file:
            for timer_name, metrics in keys['timers'].items():
                for metric_name, metric_value in metrics.items():
                   sender_file.write("- timer[{0}.{1}] {2}\n"
                      .format(timer_name, metric_name, metric_value))
    send_metrics("timer")


def send_metrics(metric_type):
    filename = "/tmp/" + metric_type + "_metrics_zabbix.sender"
    call("zabbix_sender -c /etc/coprocesses/zabbix/zabbix_agentd.conf -i "
       + filename + " >/dev/null", shell=True)
    print time.time() - startTime
```

THE ENFIELD METHOD

- Accurate, single-shot, immediate feedback
- Like the rifle
- Backoff under network issues
- Greater confidence in container state
- Greater confidence in state of whole system
- More frequent updates

STATE TO STATE

- State in service discovery
- State in event management
- End-to-end view of whole system
- State history
- Dev/Ops on the same page
- State manipulation!

STATE CONTROL

- Consul keeps configuration state
- Monitoring performance and availability state
- Dynamic Asset database
- Automate scheduling, scaling, archiving

WHAT IF I TOLD YOU
SIRI IS A PERSONAL ASSISTANT, NOT A TALK-BUDDY
quickmeme.com

THE CONCIERGE SCHEDULER

- Containers Auto-register
- Push & pull state
- Optimised over many years
- Monitoring grouping them services
- Data about whole system
- Basically just runs *docker-compose scale*

SCALING

- Complex trigger profiles
- Pre-scaling using a predictive trigger
- Compare upstream service performance as well
- Vertical scaling
- Escalation steps
- Scaling events and problem events in one system

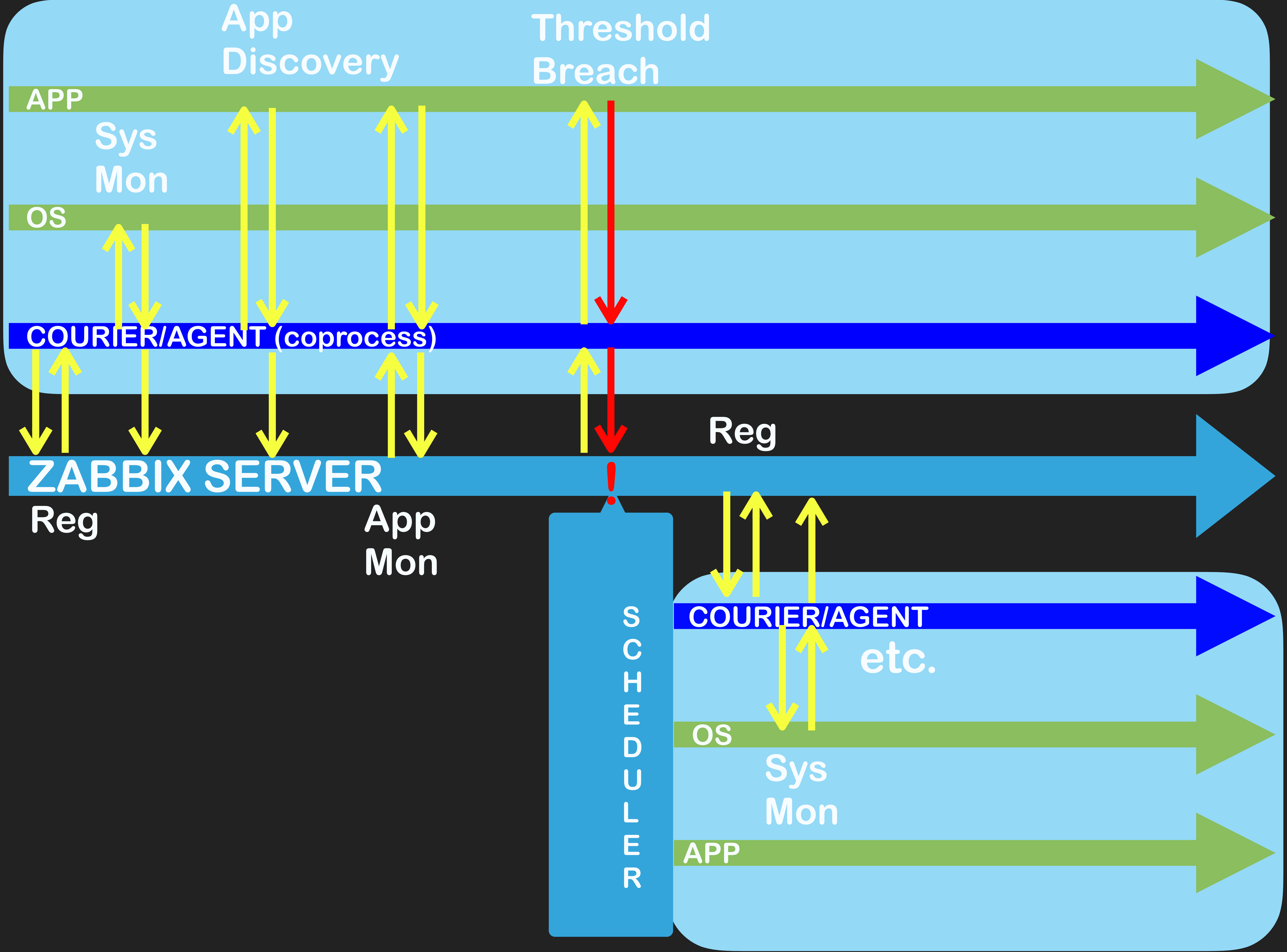
CONCIERGE_SCHEDULER.SH

```
# Variable assignment
action=$1; service_name=$2; current_scale=$3; increment=$4

scale_service(){
    /usr/bin/docker-compose --tlsverify --tlscert=${DOCKER_CERT_PATH}cert.pem \
       --tlscacert=${DOCKER_CERT_PATH}ca.pem \
       --tlskey=${DOCKER_CERT_PATH}key.pem --project-name dockerlx \
       --host tcp://dockerapi-private-lab1.mesoform.com:2376 --file /tmp/docker-compose.yml \
       scale ${service_name}=$1
    echo "$(date): Scaled ${service_name} from ${current_scale} to $1" \
       >> /tmp/app_scheduler_output
    exit 0
}

scale_up(){
    desired_scale=$((current_scale + increment))
    scale_service ${desired_scale}
}

scale_down(){
    desired_scale=$((current_scale - increment))
    scale_service ${desired_scale}
}
```


App
Discovery
Threshold
Breach
APP
Sys
Mon
OS
COURIER/AGENT (coprocess)
Reg
ZABBIX SERVER
!
Reg
App
Mon
S
C
H
E
D
U
L
E
R
COURIER/AGENT
etc.
OS
Sys
Mon
APP

MANIFEST COLLECTION

	Hosts	Key	Interval	Type
totypes	Host prototypes	system.run[/usr/local/bin/concierge_courier.py discover_timers http://localhost:8080/metrics]	5m	Zabbix agent (active)
totypes 1	Host prototypes	vfs.fs.discovery	1h	Zabbix agent (active)
totypes 1	Host prototypes	net.if.discovery	1h	Zabbix agent (active)

MANIFEST COLLECTION

```
def discover_timers():
    """
    Output Zabbix formatted JSON of keys
    """
    # just for testing purposes, simply open a file with metrics
    with open("/tmp/metrics.json", "r") as metrics_file:
        keys = metrics_file.read()
        keys_json = json.loads(keys)

        discovery_data_dict = \
            {'data': [{"{#TIMER}": key} for key in keys_json['timers']]}
        print(json.dumps(discovery_data_dict))
```

DELIVERY ADDRESSES

PP::my_app   Discovery list / discover application timers   Item prototypes 11   Trigger prototypes   Graph prototypes   Host prototypes

	Key	Interval	History	Trends	Type
d: {#TIMER}::count	timer[{#TIMER}.count]		7d	365d	Zabbix trapper
d: {#TIMER}::max	timer[{#TIMER}.max]		7d	365d	Zabbix trapper
d: {#TIMER}::mean	timer[{#TIMER}.mean]		7d	365d	Zabbix trapper
d: {#TIMER}::mean_rate	timer[{#TIMER}.mean_rate]		7d	365d	Zabbix trapper
d: {#TIMER}::min	timer[{#TIMER}.min]		7d	365d	Zabbix trapper
d: {#TIMER}::p75	timer[{#TIMER}.p75]		7d	365d	Zabbix trapper
d: {#TIMER}::p95	timer[{#TIMER}.p95]		7d	365d	Zabbix trapper
d: {#TIMER}::p98	timer[{#TIMER}.p98]		7d	365d	Zabbix trapper
d: {#TIMER}::p99	timer[{#TIMER}.p99]		7d	365d	Zabbix trapper
d: {#TIMER}::p999	timer[{#TIMER}.p999]		7d	365d	Zabbix trapper
d: {#TIMER}::stddev	timer[{#TIMER}.stddev]		7d	365d	Zabbix trapper

DELIVERY ADDRESSES

OS::Linux: Maximum number of processes	Triggers 1	kernel.maxproc	1h	7d	365d	Zabbix agent (active)	OS
discover application timers: my.test-timer-0::count		timers[my.test-timer-0.count]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-0::max		timers[my.test-timer-0.max]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-0::mean		timers[my.test-timer-0.mean]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-0::mean_rate		timers[my.test-timer-0.mean_rate]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-0::min		timers[my.test-timer-0.min]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-0::p75		timers[my.test-timer-0.p75]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-0::p95		timers[my.test-timer-0.p95]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-0::p98		timers[my.test-timer-0.p98]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-0::p99		timers[my.test-timer-0.p99]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-0::p999		timers[my.test-timer-0.p999]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-0::stddev		timers[my.test-timer-0.stddev]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-10::count		timers[my.test-timer-10.count]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-10::max		timers[my.test-timer-10.max]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-10::mean		timers[my.test-timer-10.mean]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-10::mean_rate		timers[my.test-timer-10.mean_rate]		7d	365d	Zabbix trapper	My App
discover application timers: my.test-timer-10::min		timers[my.test-timer-10.min]		7d	365d	Zabbix trapper	My App

ITEM DELIVERY

Triggers	Key	Interval	History	Trends		Appl
Triggers 2	agent.ping	1m	7d	365	Zabbix agent	Zabb
Triggers 2	system.run[/usr/local/bin/concierge_courier.py get_timers http://localhost:8080/metrics]	1m	7d	365	Zabbix agent	Moni
Triggers 3	container.state		3d		Zabbix trapper	Dock

ITEM DELIVERY

```
def get_timers():
    with open("/tmp/metrics.json", "r") as metrics_file:
        keys = metrics_file.read()
        keys = json.loads(keys)
        with open("/tmp/timer_metrics_zabbix.sender", "w") as sender_file:
            for timer_name, metrics in keys['timers'].items():
                for metric_name, metric_value in metrics.items():
                   sender_file.write("- timer[{0}.{1}] {2}\n"
                      .format(timer_name, metric_name, metric_value))
    send_metrics("timer")


def send_metrics(metric_type):
    filename = "/tmp/" + metric_type + "_metrics_zabbix.sender"
    call("zabbix_sender -c /etc/coprocesses/zabbix/zabbix_agentd.conf -i "
       + filename + " >/dev/null", shell=True)
    print time.time() - startTime
```

EVENT TRIGGERS

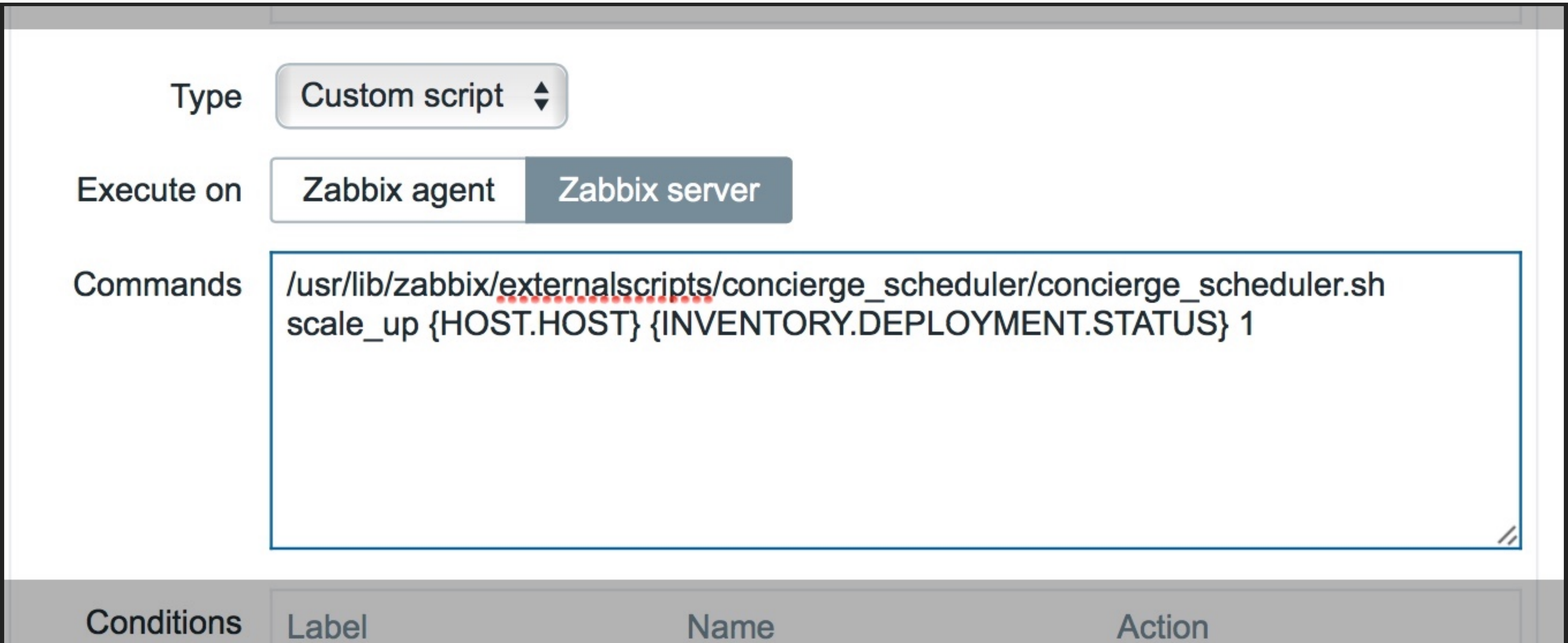
		Expression
as been changed on {HOST.NAME}		{app-my_app:vfs.file.cksum[/etc/passwd].diff(0)}>0
RGE::courier::metric::collection::FAILED (CODE={ITEM.VALUE})	1	{app-my_app:system.run[/usr/local/bin/concierge_courier.py get_timers http://localhost:8080/metrics].last()}<=0
RGE::courier::metric::collection>{$COURIER_SLOW} (TIME={ITEM.VALUE})	2	{app-my_app:system.run[/usr/local/bin/concierge_courier.py get_timers http://localhost:8080/metrics].last()}>{$COURIER_SLOW}
er: Container state of {HOST.NAME} is {ITEM.VALUE}	3	{app-my_app:container.state.last()}=0
erloaded on {HOST.NAME}		{app-my_app:system.cpu.util[,iowait].avg(5m)}>20
wap space on {HOST.NAME}		{app-my_app:system.swap.size[,pfree].last(0)}<50
er: No heartbeat from {HOST.NAME} in last 2 minutes	4	{app-my_app:container.state.nodata(2m)}=2
d is too high on {HOST.NAME}	5	{app-my_app:system.cpu.load[percpu,avg1].avg(5m)}>5
er: Push and Pull checks on {HOST.NAME} are both unreachable for 1 minute	6	{app-my_app:agent.ping.nodata(1m)}=1 and {app-my_app:container.state.nodata(1m)}=1

SERVICE STATE

	Triggers	Key
te: Service::Consul::containers::running	Triggers 1	grpsum["{$SERVICE_HOSTGROUP}","container.state",last]
te: Service::Consul::my.test-timer-14::p95		grpavg["{$SERVICE_HOSTGROUP}","timer[my.test-timer-14.p95]",last]
te: Service::Consul::storage::usage		grpsum["{$SERVICE_HOSTGROUP}","vfs.fs.size[/,free]",last]
te: Service::Consul::system::load::1min	Triggers 2	grpavg["{$SERVICE_HOSTGROUP}","system.cpu.load[percpu,avg1]",last]
te: Service::Zabbix::agents::responding		grpsum["{$SERVICE_HOSTGROUP}","agent.ping",last]

SCALING ACTIONS

Name ▲	Conditions
Service scale down due to low load	Maintenance status not in *maintenance* Trigger = *SERVICES::aggregate: service-aggregates::load::low::*UNKNOWN**
Service scale up due to high load	Maintenance status not in *maintenance* Trigger = *SERVICES::aggregate: service-aggregates::load::high::*UNKNOWN**



Type: Custom script

Execute on: Zabbix agent [✓ Zabbix server]

Commands:

```
/usr/lib/zabbix/externalscripts/concierge_scheduler/concierge_scheduler.sh
scale_up {HOST.HOST} {INVENTORY.DEPLOYMENT.STATUS} 1
```

Conditions

Label	Name	Action

CONCIERGE_SCHEDULER.SH

```
# Variable assignment
action=$1; service_name=$2; current_scale=$3; increment=$4

scale_service(){
    /usr/bin/docker-compose --tlsverify --tlscert=${DOCKER_CERT_PATH}cert.pem \
       --tlscacert=${DOCKER_CERT_PATH}ca.pem \
       --tlskey=${DOCKER_CERT_PATH}key.pem --project-name dockerlx \
       --host tcp://dockerapi-private-lab1.mesoform.com:2376 --file /tmp/docker-compose.yml \
       scale ${service_name}=$1
    echo "$(date): Scaled ${service_name} from ${current_scale} to $1" \
       >> /tmp/app_scheduler_output
    exit 0
}

scale_up(){
    desired_scale=$((current_scale + increment))
    scale_service ${desired_scale}
}

scale_down(){
    desired_scale=$((current_scale - increment))
    scale_service ${desired_scale}
}
```

SCALING TRIGGERS

	Expression
gate: {HOST.HOST}::load::high::{ITEM.VALUE}	{consul:grpavg["{$SERVICE_HOSTGROUP}","system.cpu.load[percpu,avg1]",last].**last()**}>{$LOAD_HIGH}
gate: {HOST.HOST}::load::low::{ITEM.VALUE}	{consul:grpavg["{$SERVICE_HOSTGROUP}","system.cpu.load[percpu,avg1]",last].**last()**}<{$LOAD_LOW}
gate: {HOST.HOST} nodes scaled to {ITEM.VALUE}	{consul:grpsum["{$SERVICE_HOSTGROUP}","container.state",last].**diff()**}=1

CONCLUSION

- Autopilot Pattern and Enfield Method
- We're already: doing event management, auto-registering, aggregating metrics, performing actions on triggers, maintaining system state, highly optimised, self-healing,
- Controlling the state
- Accuracy and performance
- Short lead time

WHATS NEXT

- Load testing Zabbix Server/Proxy
- Use Zabbix Python interpreter module
- Make this native in Zabbix?
- DevOps everything!

SO LONG AND THANKS FOR ALL THE FISH

- Read the full article at http://www.mesoform.com/blog-listing/info/the-concierge-paradigm
- Search: "mesoform concierge paradigm"
- @MesoformLtd
- /mesoform
- /mesoform
- http://www.mesoform.com/contact-us