

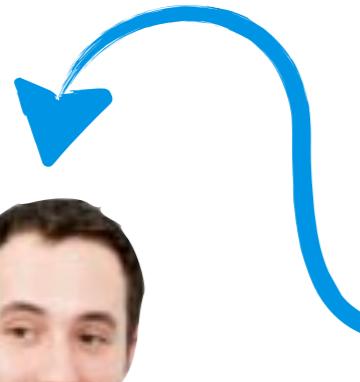


H . A . IN YOUR DATACENTER

WHO NEEDS CLOUDS ?



@pitluga

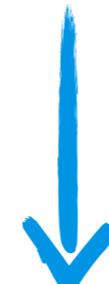


TONY PITLUGA

PAUL HINZE



@phinze



Brain**tree**

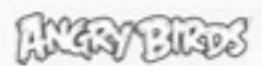
A smarter way to accept credit cards online

[Get started](#)or [Take a tour](#)

We simplify payments for thousands of online businesses



OpenTable®



37signals

livingsocial



We've expanded globally.

[Learn more.](#)

Canada



Europe

We ❤ Developers... and they love us too.

[See why](#)

Integrate with our Payment Gateway in a Snap

You'll be up and running in less than a day, with our human-readable APIs, and idiomatic Client Libraries available in 7 languages and on 3 mobile platforms. [Learn more](#)



From Startups to Heavyweights

We take pride in helping companies grow from the garage to around the globe. You'll never outgrow Braintree. [Learn more](#)

Rave-worthy Support

We bend over backwards to notify clients about issues before they become a problem. Our support team resolves problems quickly,



Upfront Pricing

There are no hidden fees or "gotchas" down the road. Your data is portable: you retain control. Because hey, you don't like surprises

OUR WORLD



DISQUS

LOTS OF PEOPLE TRUST US



LevelUp



A large flock of birds, possibly starlings or crows, is captured in flight against a clear blue sky. The birds are densely packed, creating a dark, swirling mass that fills most of the frame. They appear to be moving from the left side of the image towards the right.

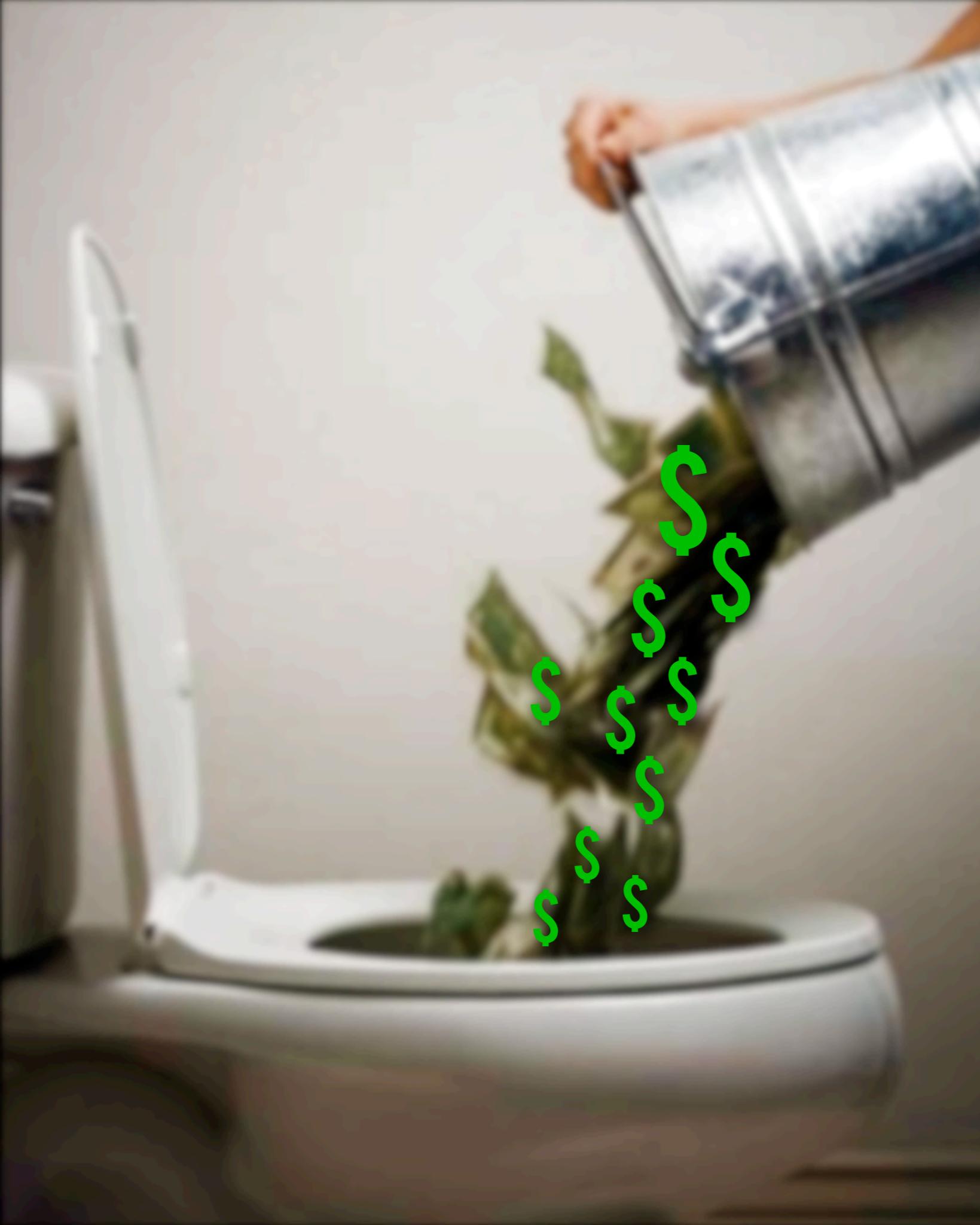
> 1 MILLION
API CALLS PER DAY

API CALLS PER DAY

IMPORTANT

> 1 MILLION



A photograph showing a person's hand holding a bundle of US dollar bills and pouring them down the open white porcelain toilet bowl. The bills are scattered around the rim of the toilet. A green dollar sign (\$) symbol is overlaid on the image, appearing to follow the path of the falling money.

DOWNTIME
REALLY
SUCKS

IN OTHER WORDS

WE HAVE
INTERESTING JOBS



WHAT WE VALUE

SIMPLE

NOT

EASY

OPEN

NOT

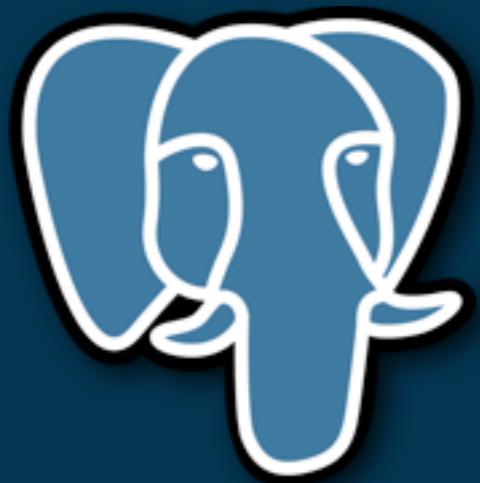
CLOSED

LOGIC

NOT

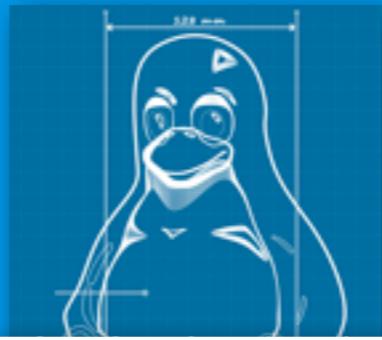
MAGIC

WHAT WE CHOOSE



NOT

ORACLE®



NOT



NOT

RSA

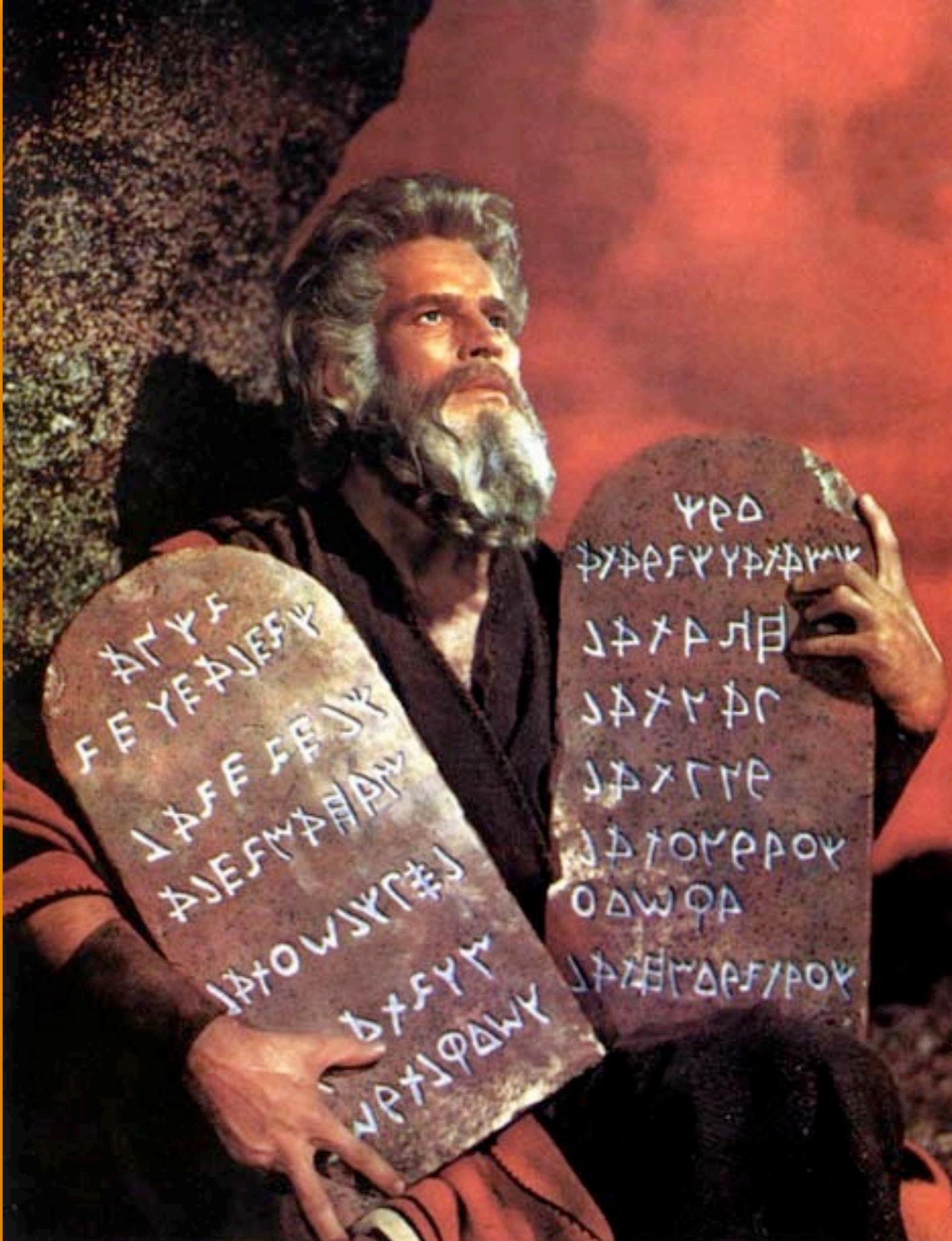
TODAY

OUR BELOVED LOAD BALANCERS

SCALABILITY
+
AVAILABILITY

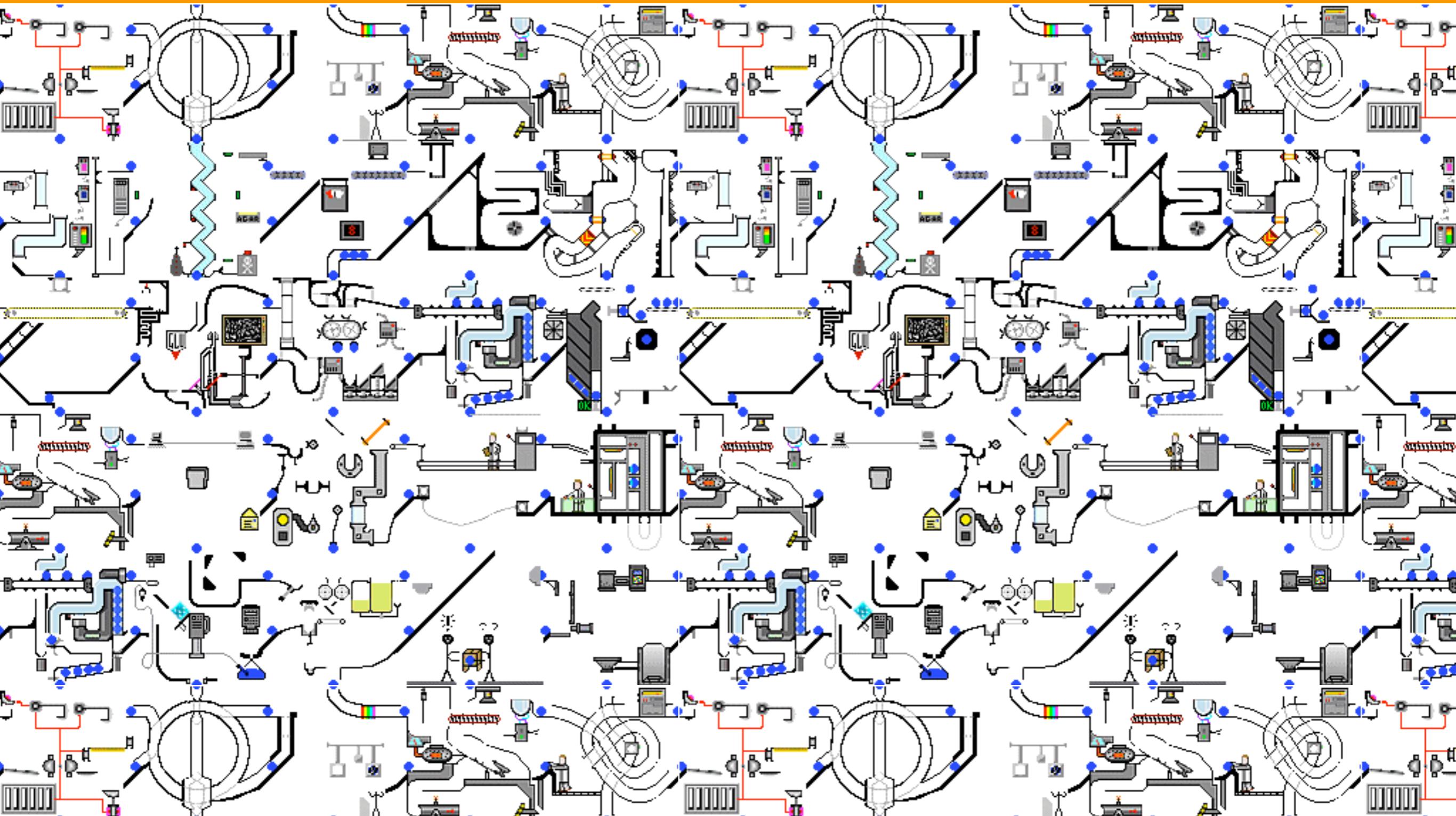


Thou
Shalt
Do One
Thing
Well



DON'T PANIC!

LOTS OF SIMPLE PIECES

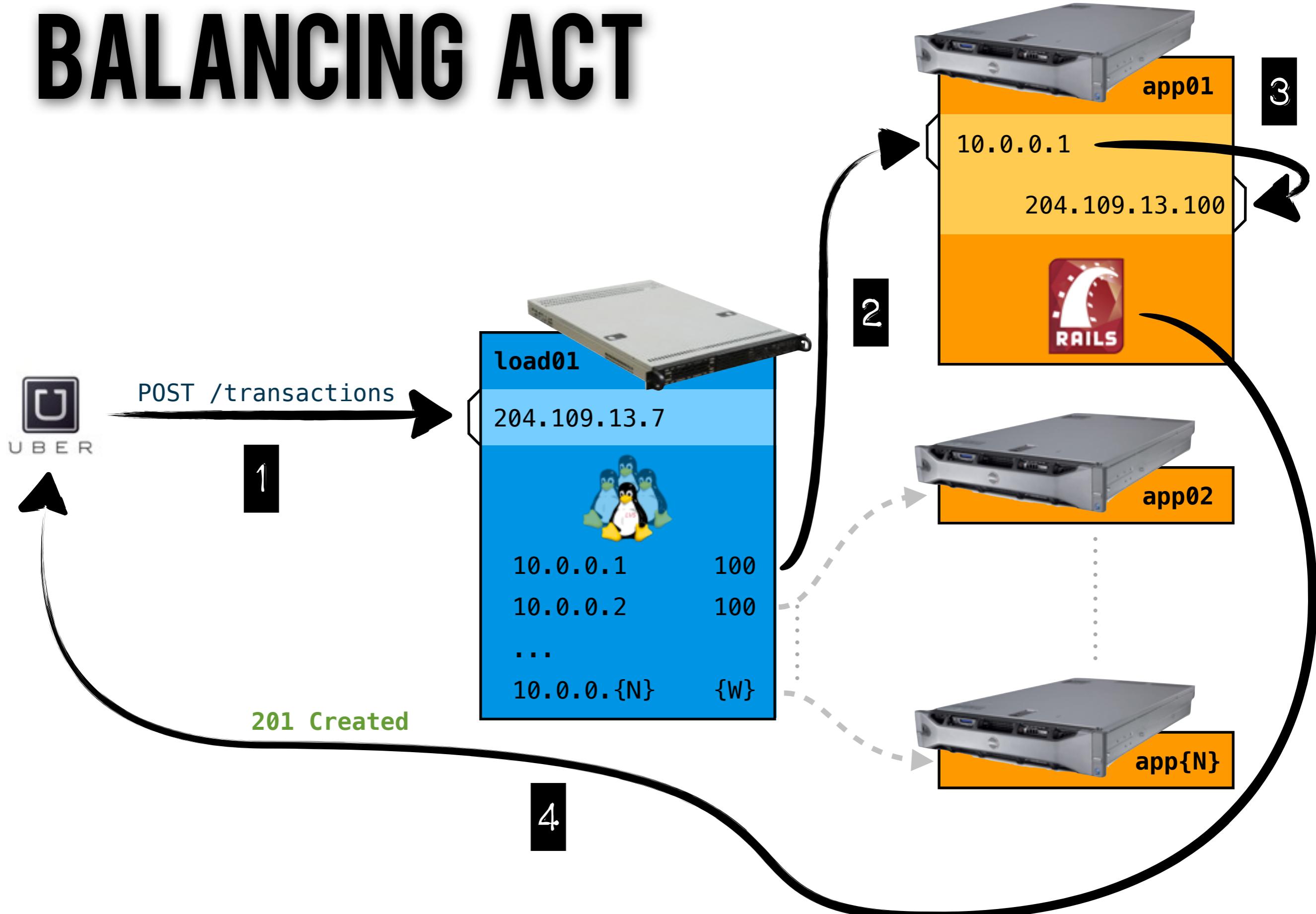




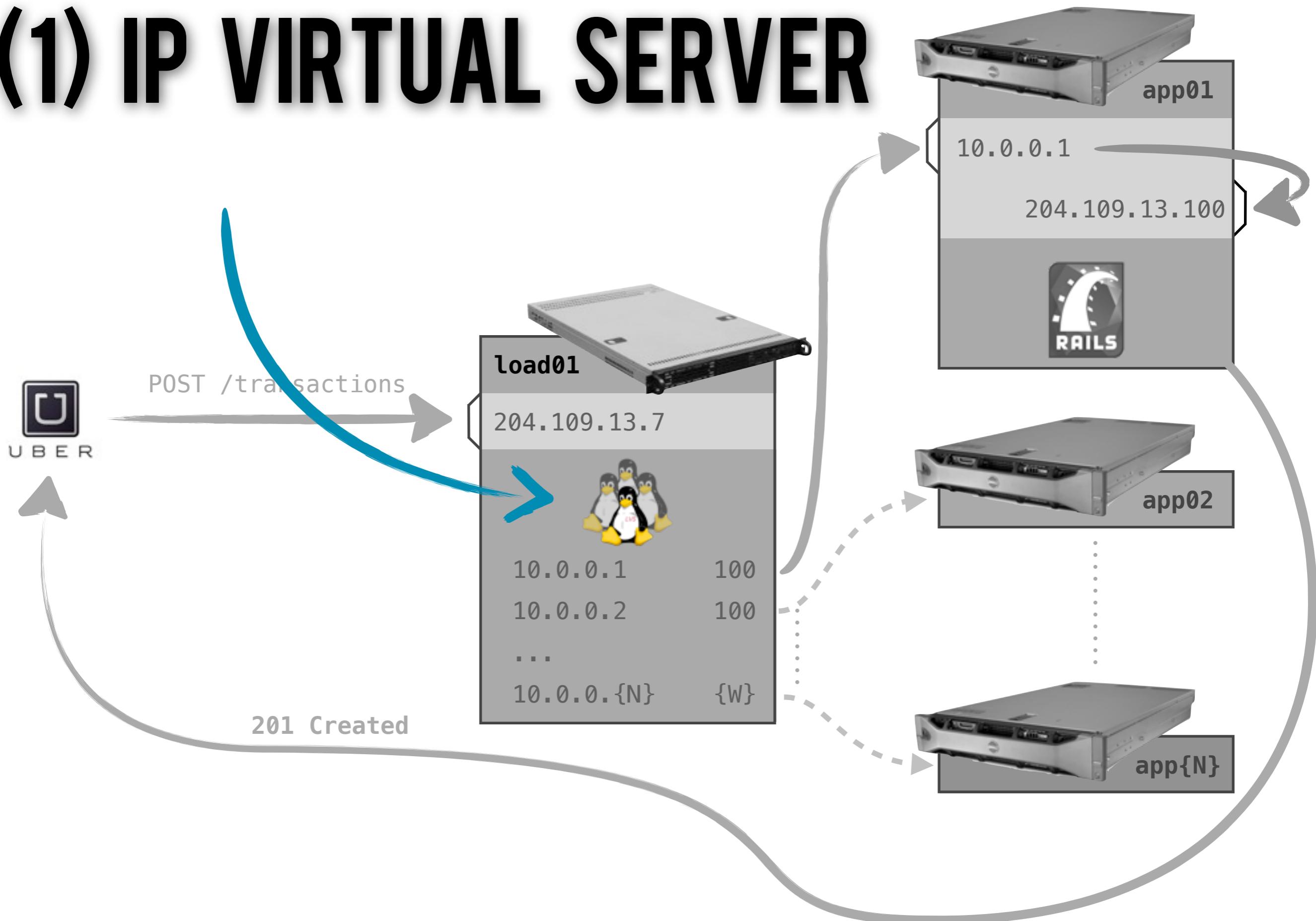
©Disney Enterprises, Inc./Pixar Animation Studios

WHOLE > SUM(PARTS)

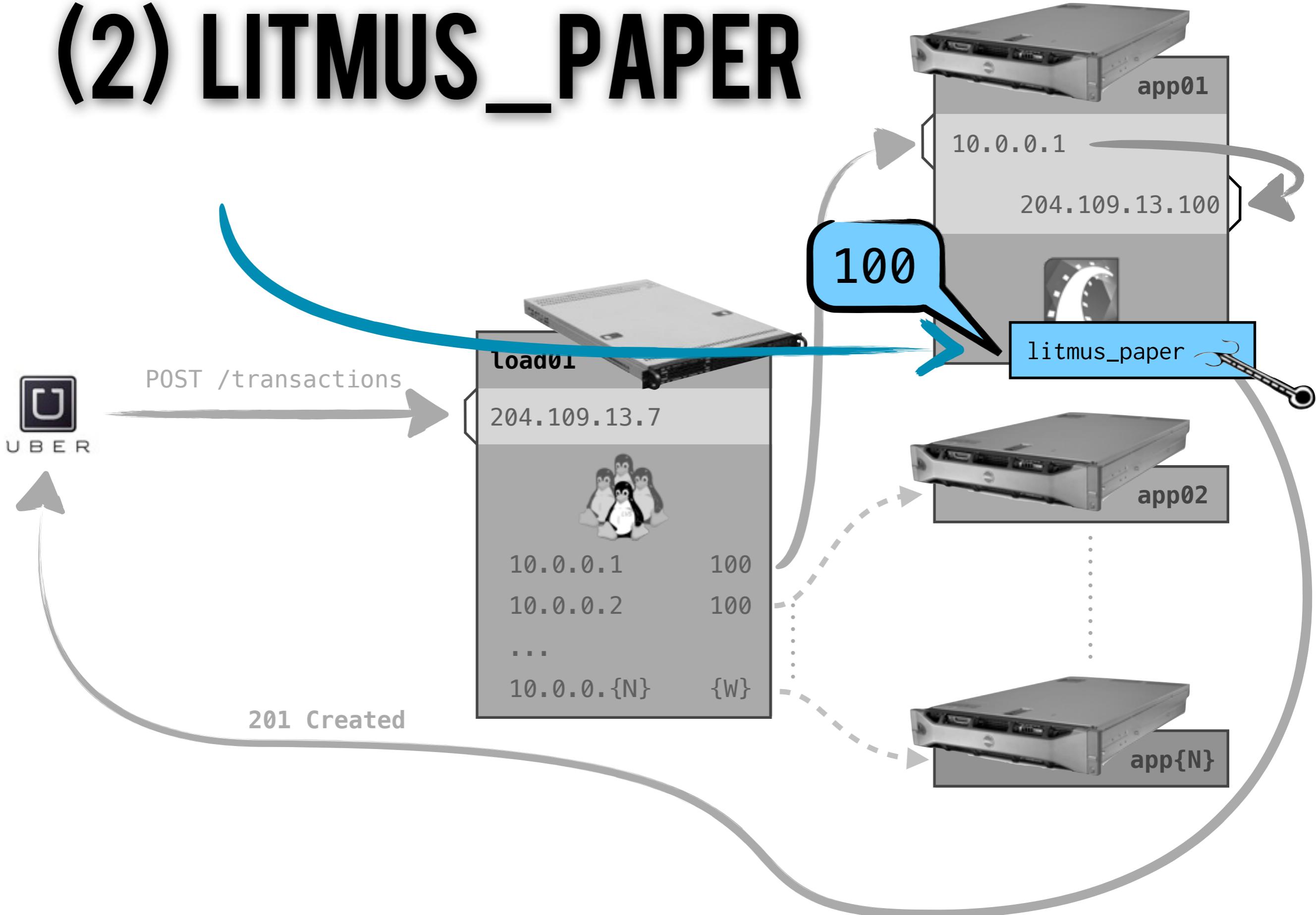
BALANCING ACT



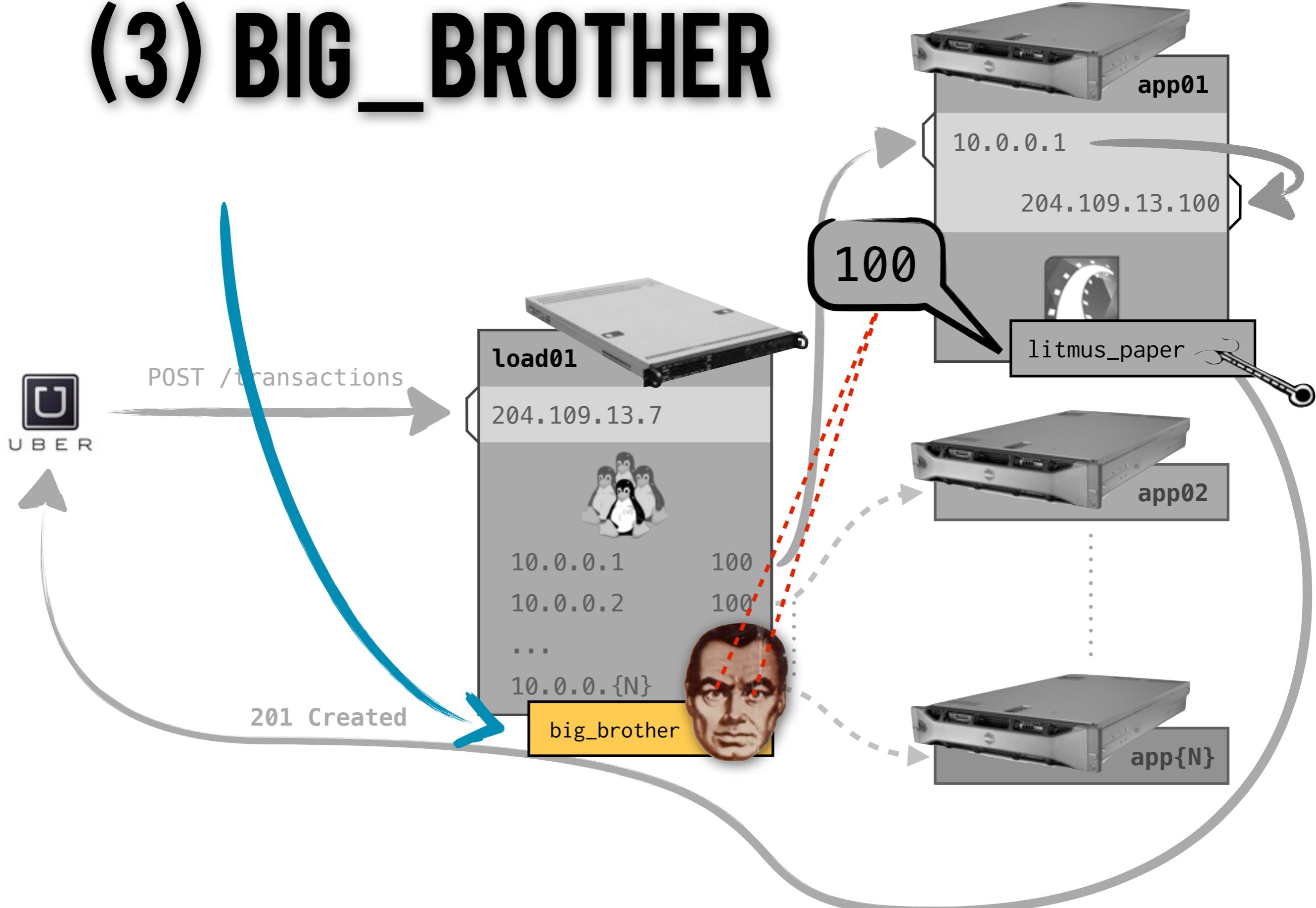
(1) IP VIRTUAL SERVER



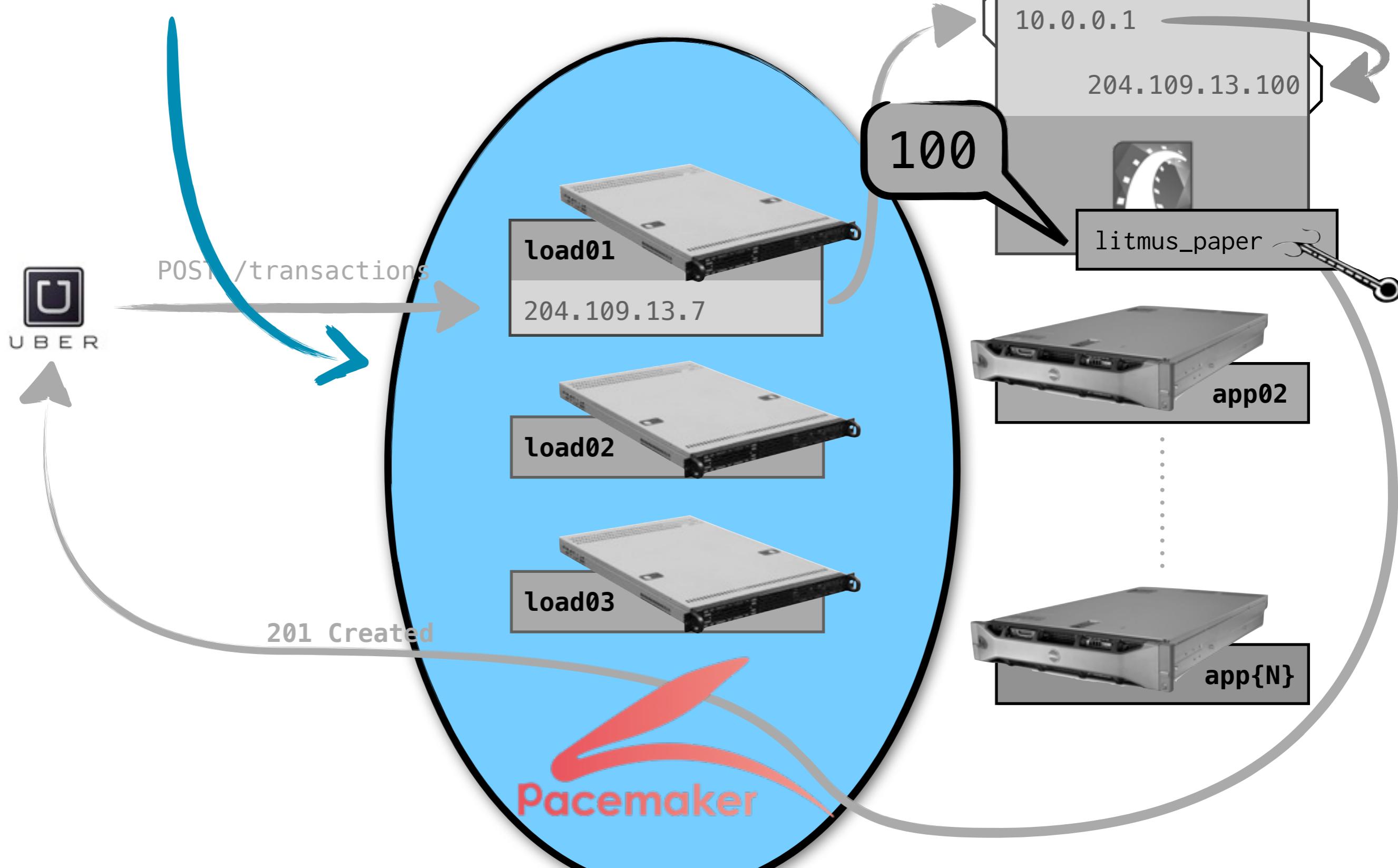
(2) LITMUS_PAPER



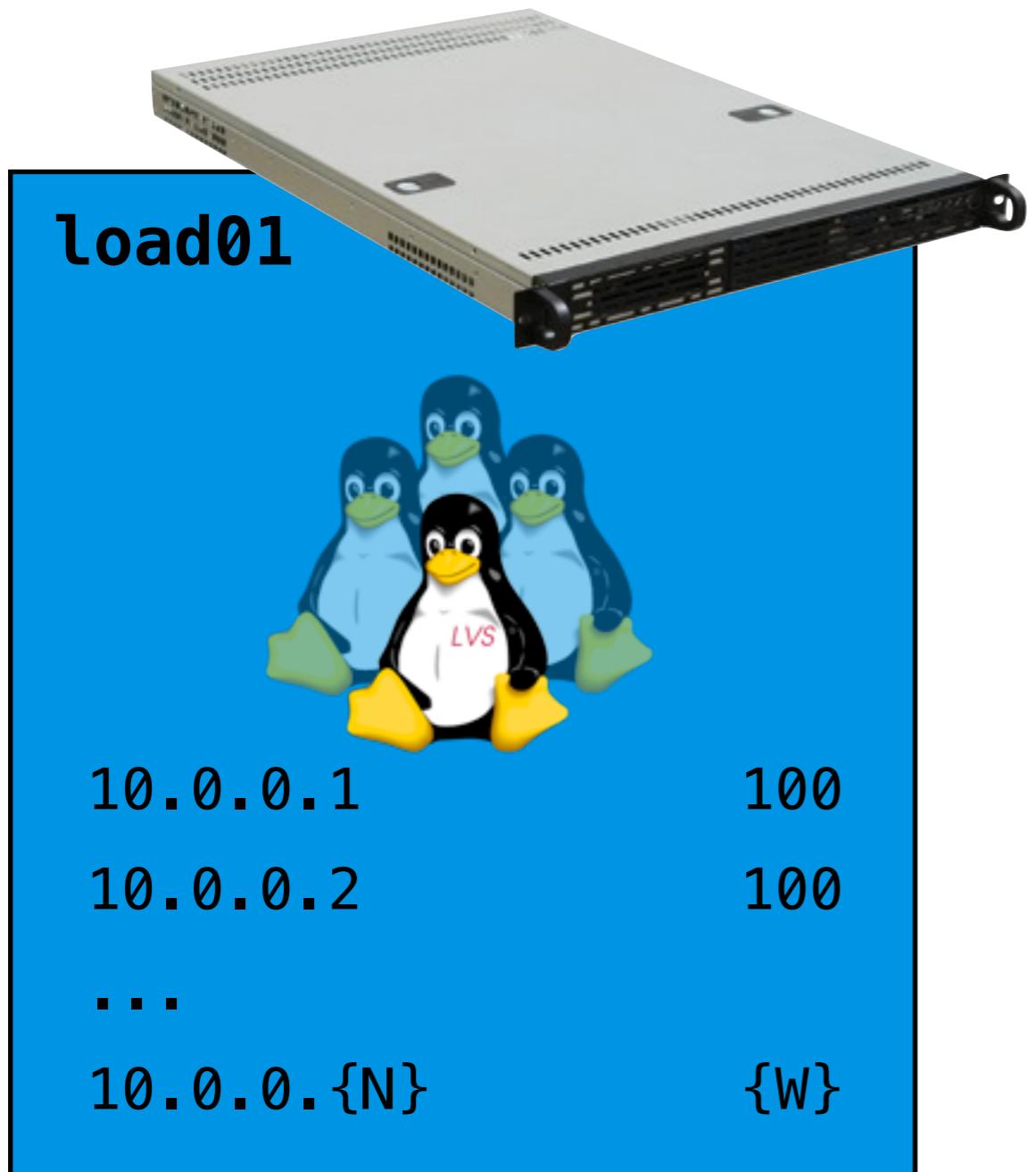
(3) BIG_BROTHER



(4) PACEMAKER

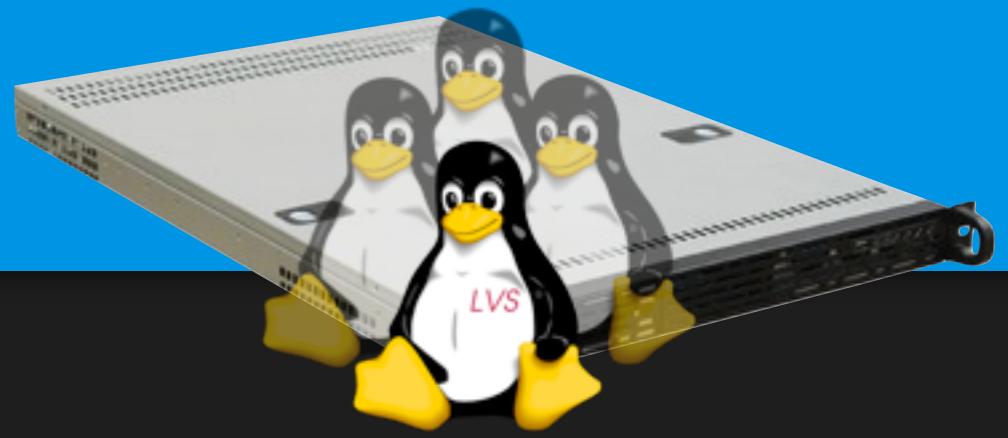


HERE GOES!



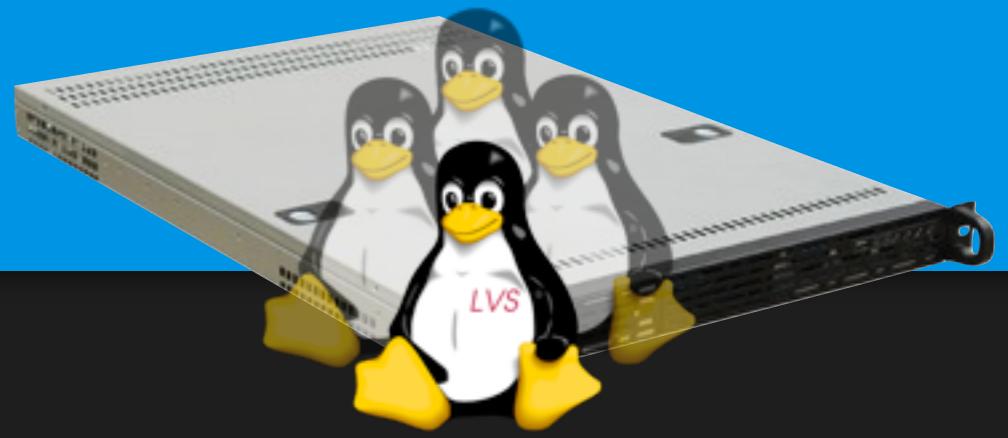
IP VIRTUAL SERVER (IPVS)

ON YOUR MARK



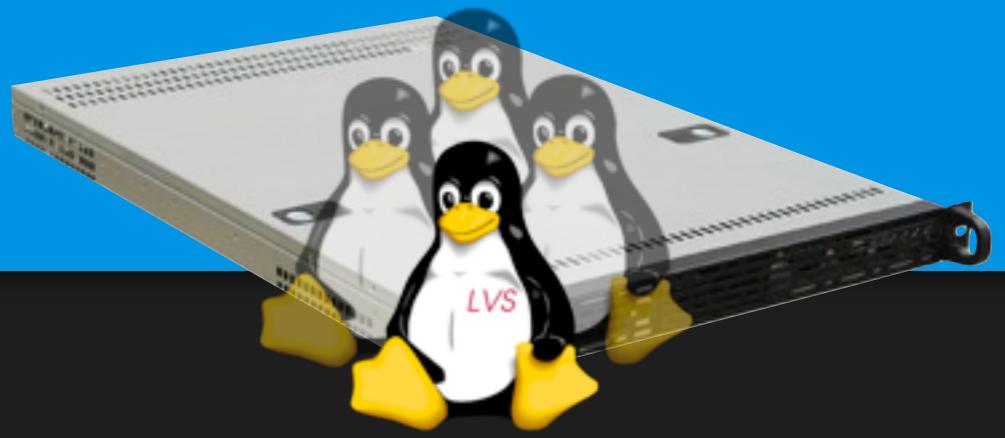
```
iptables --table mangle  
        --append PREROUTING  
        --destination 205.109.13.7/32  
        --interface eth70  
        --protocol tcp  
        --match tcp --dport 443  
        --jump MARK --set-mark 0x07
```

ON YOUR MARK



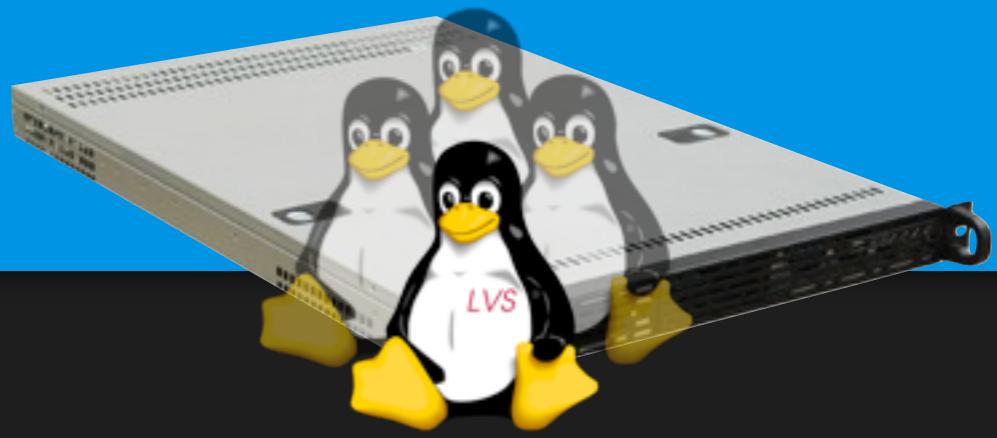
```
iptables --table mangle  
--append PREROUTING  
--destination 205.109.13.7/32  
--interface eth70  
--protocol tcp  
--match tcp --dport 443  
--jump MARK --set-mark 0x07
```

GET SET



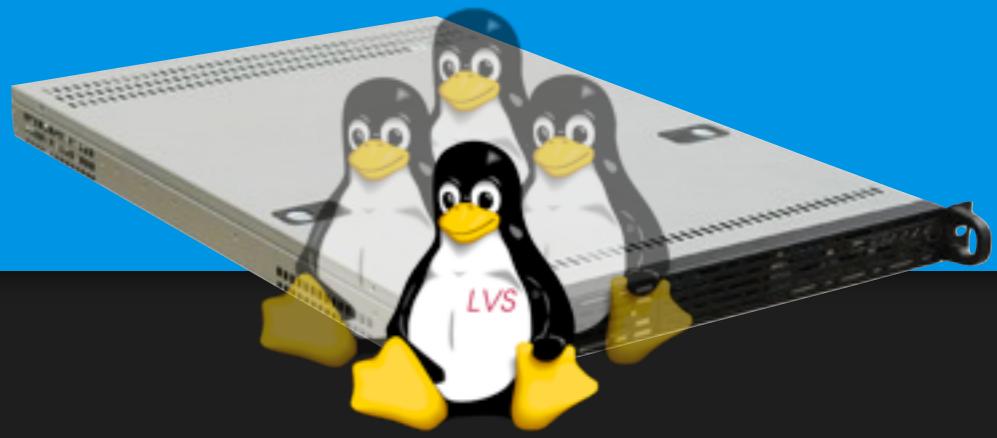
```
ipvsadm --add-service  
--fwmark-service 7  
--scheduler wlc
```

GET SET



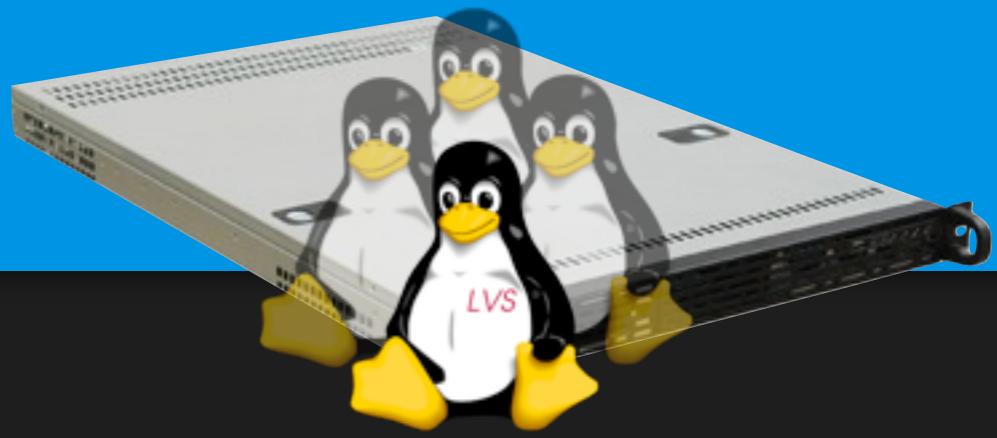
```
ipvsadm --add-service  
--fwmark-service 7  
--scheduler wlc
```

AND THEY'RE OFF!



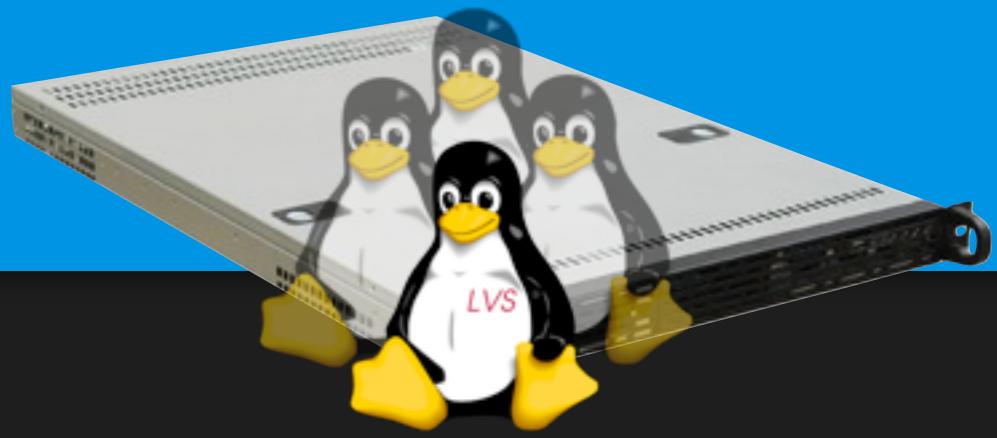
```
ipvsadm --add-server  
--fwmark-service 7  
--real-server 10.0.0.1  
--ipip  
--weight 100
```

AND THEY'RE OFF!



```
ipvsadm --add-server  
      --fwmk-service 7  
      --real-server 10.0.0.1  
      --ipip  
      --weight 100
```

AND THEY'RE OFF!



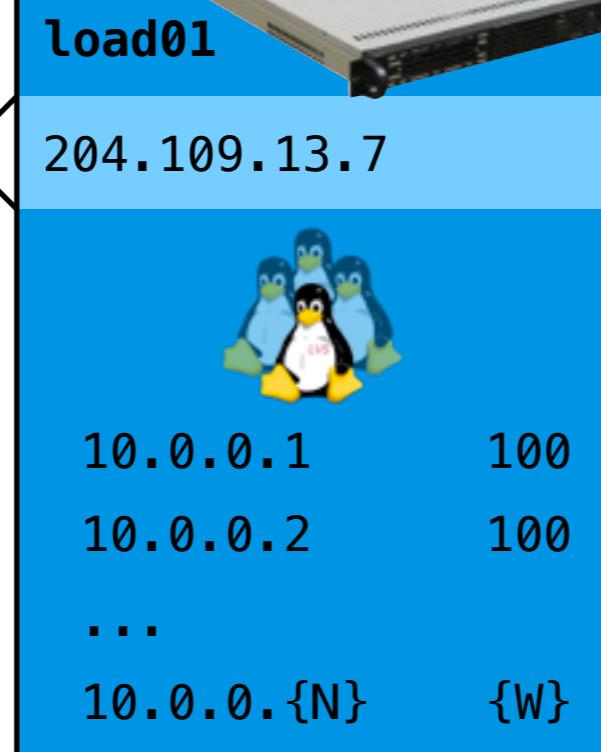
```
ipvsadm --add-server  
--fwmark-service 7  
--real-server 10.0.0.2  
--ipip  
--weight 100
```

NOW YOU'RE BALANCING WITH FOSS!

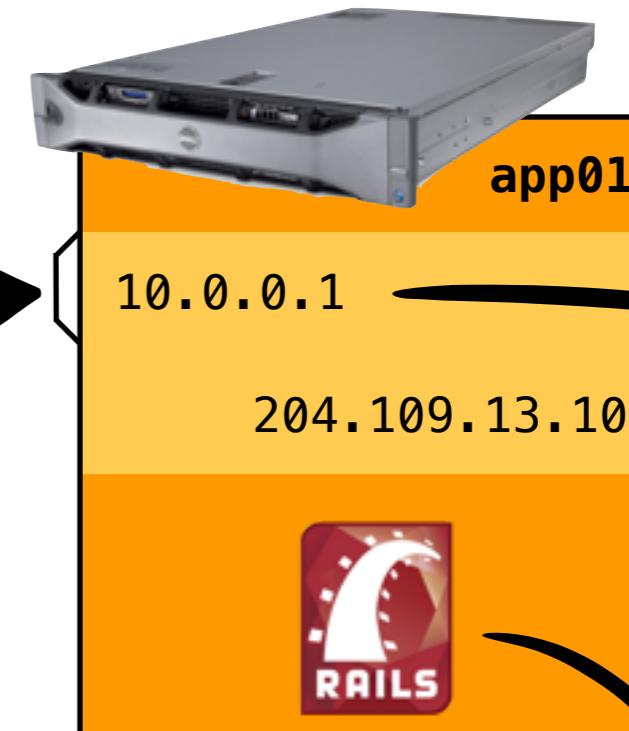


↑

POST /transactions

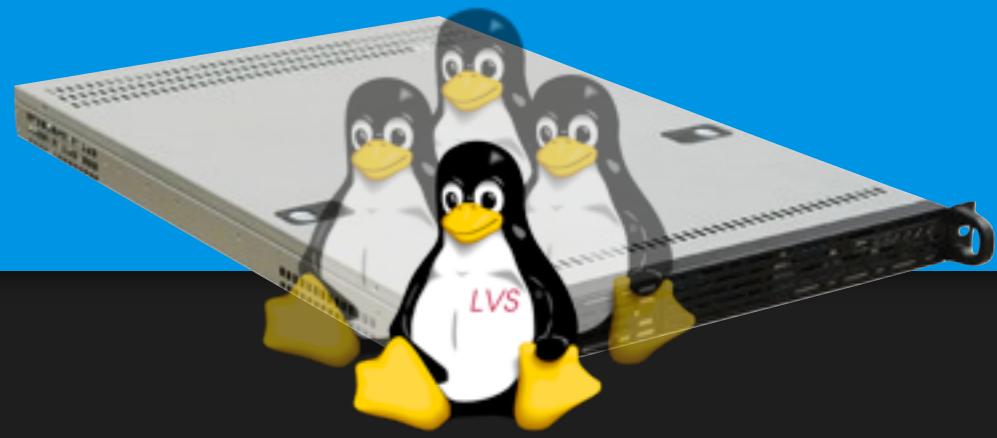


201 Created



OK, SO WHAT?

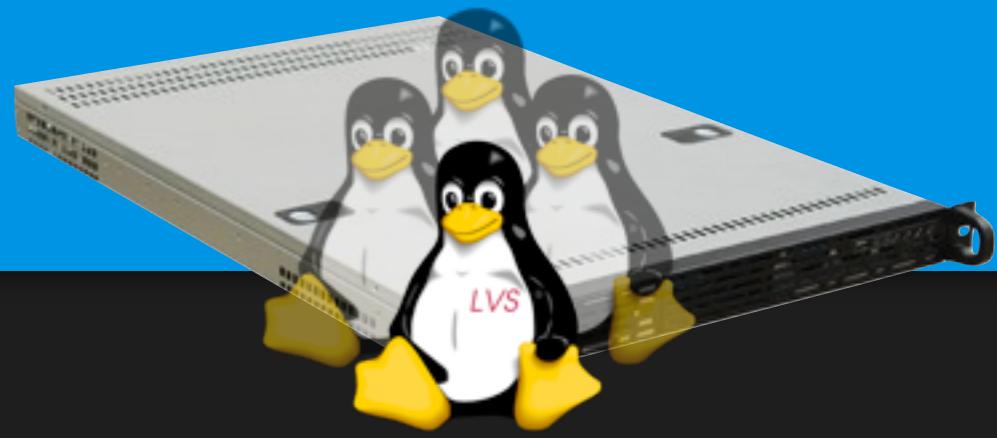
WEIGHT WEIGHT DON'T TELL ME



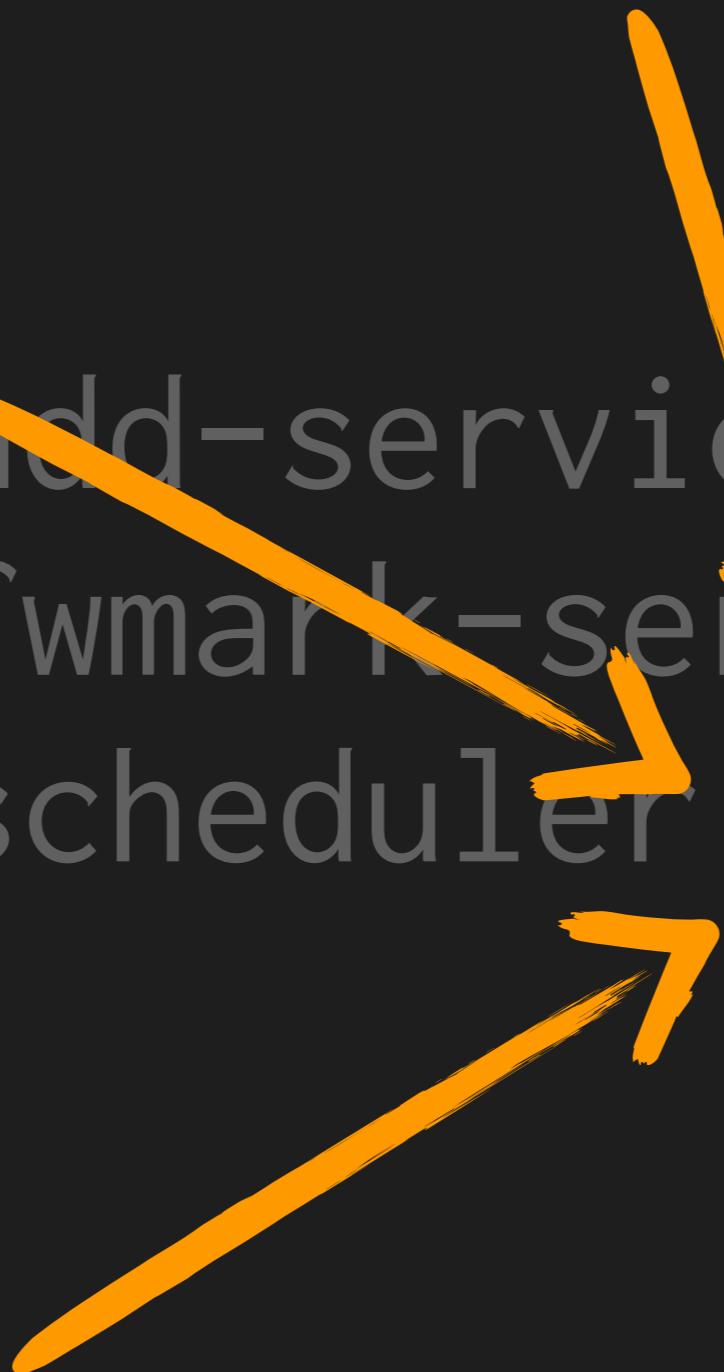
```
ipvsadm --add-server  
          --fwmark-service 7  
          --real-server 10.0.0.1  
          -> ipip  
          --weight 100
```

The command shown is for adding a server to an IPVS service. It includes options for the fwmark, real server IP, and weight. The word 'ipip' is present in the command, likely a typo for 'ipip'. The '--weight 100' option is highlighted with a green color and a blue oval.

WEIGHT WEIGHT DON'T TELL ME



```
ipvsadm --add-service  
--fwmark-service 7  
--scheduler wlc
```



A stylized illustration of a character with a blue face, green hair, and red hair. The character has a red rose on their chest and is wearing a blue suit. The background is yellow.

THE
POWER IS
YOURS!

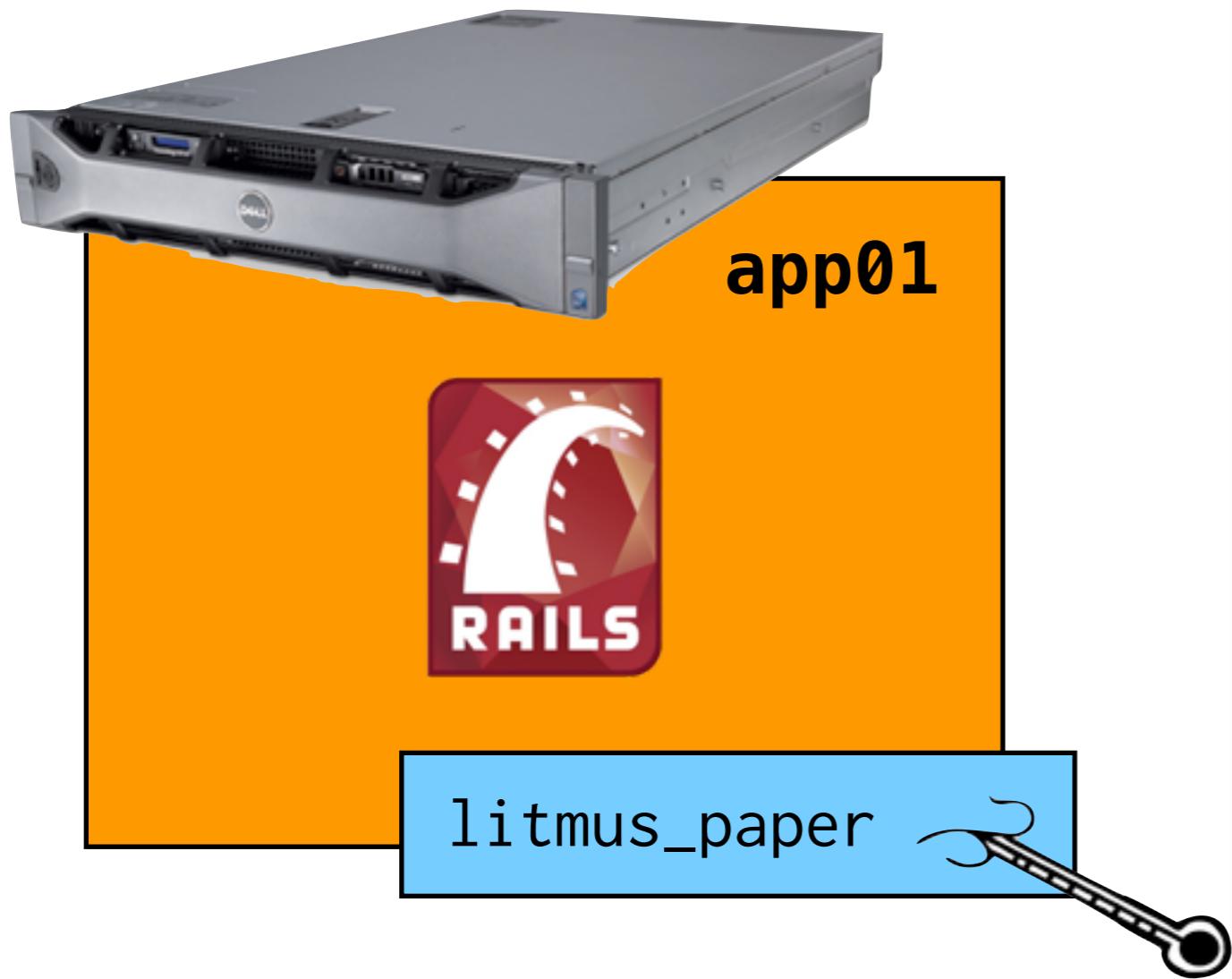
WEIGHT == “HEALTH” OF NODE

HOW DO WE GET HEALTH?

litmus_paper



[braintree/litmus_paper](https://github.com/braintree/litmus_paper)



DETERMINES HEALTH OF SINGLE NODE

HEALTH == **DEPENDENCIES**
+
METRICS

A LITMUS_PAPER CHECK



```
service "webapp" do |s|
  s.depends Dependency::HTTP,
    "http://localhost:3000/heartbeat"

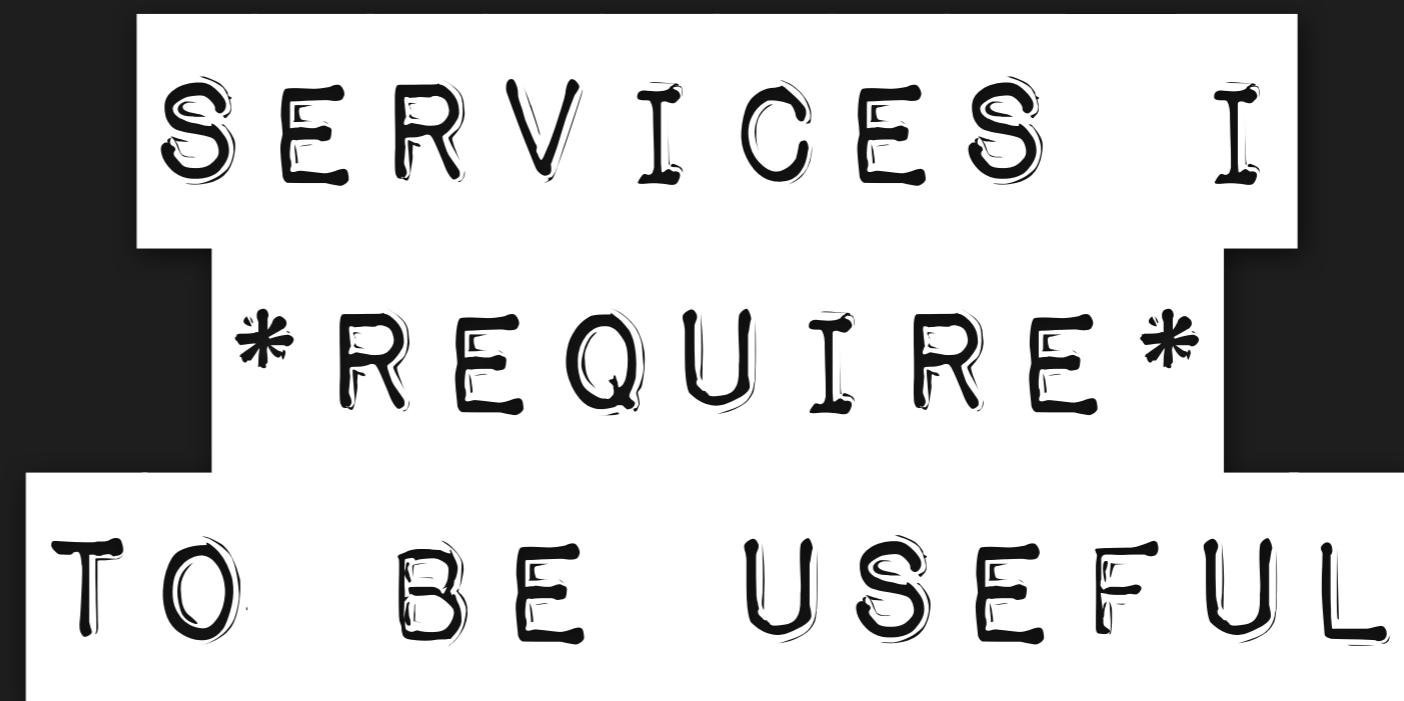
  s.measure_health Metric::CPULoad, :weight => 50
  s.measure_health Metric::AvailableMemory, :weight => 50
end
```

A LITMUS_PAPER CHECK



```
service "webapp" do |s|
  s.depends Dependency::HTTP,
    "http://localhost:3000/heartbeat"
```

```
s.measure_health Metric::CPULoad, :weight => 50
s.measure_health Metric::AvailableMemory, :weight => 50
end
```



A LITMUS_PAPER CHECK



```
service "webapp" do |s|
  s.depends Dependency::HTTP,
    "http://localhost:3000/heartbeat"
  s.measure_health Metric::CPULoad, :weight => 50
  s.measure_health Metric::AvailableMemory, :weight => 50
end
```

HOW HEALTHY
AM I
GENERALLY?

EASY TO EXTEND



```
require 'postfix_litmus'

service "mailman" do |s|
  s.depends PostfixLitmus::Dependency, "localhost:543"

  s.measure_health PostfixLitmus::MailQSize,
    :max_size => 1000,
    :weight => 100
end
```

EASY HTTPEASY



```
$ curl localhost
```

Litmus Paper 0.6.0

Services monitored:

- * webapp (87.5)

EASY HTTP EASY



```
$ curl localhost/webapp/status
```

Health: 87.5

Dependency::HTTP(http://localhost:3000/heartbeat): 0K

Metric::CPULoad(50): 49.5

Metric::AvailableMemory(50): 38

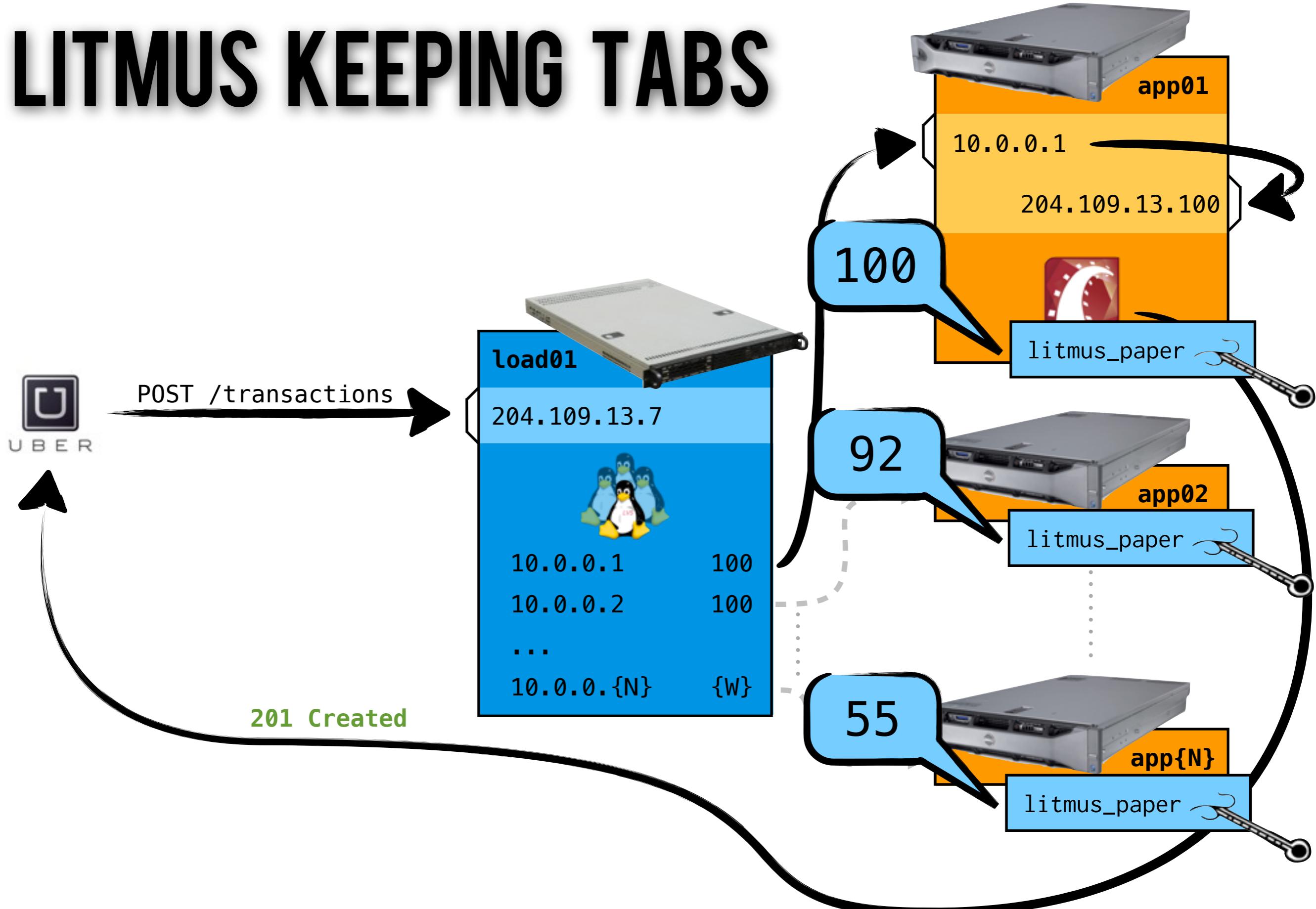
MAINTENANCE W/ LITMUSCTL



```
$ litmusctl force down webapp  
Reason? apt upgrades
```

```
$ curl localhost/webapp/status  
Health: 0  
apt upgrades
```

LITMUS KEEPING TABS



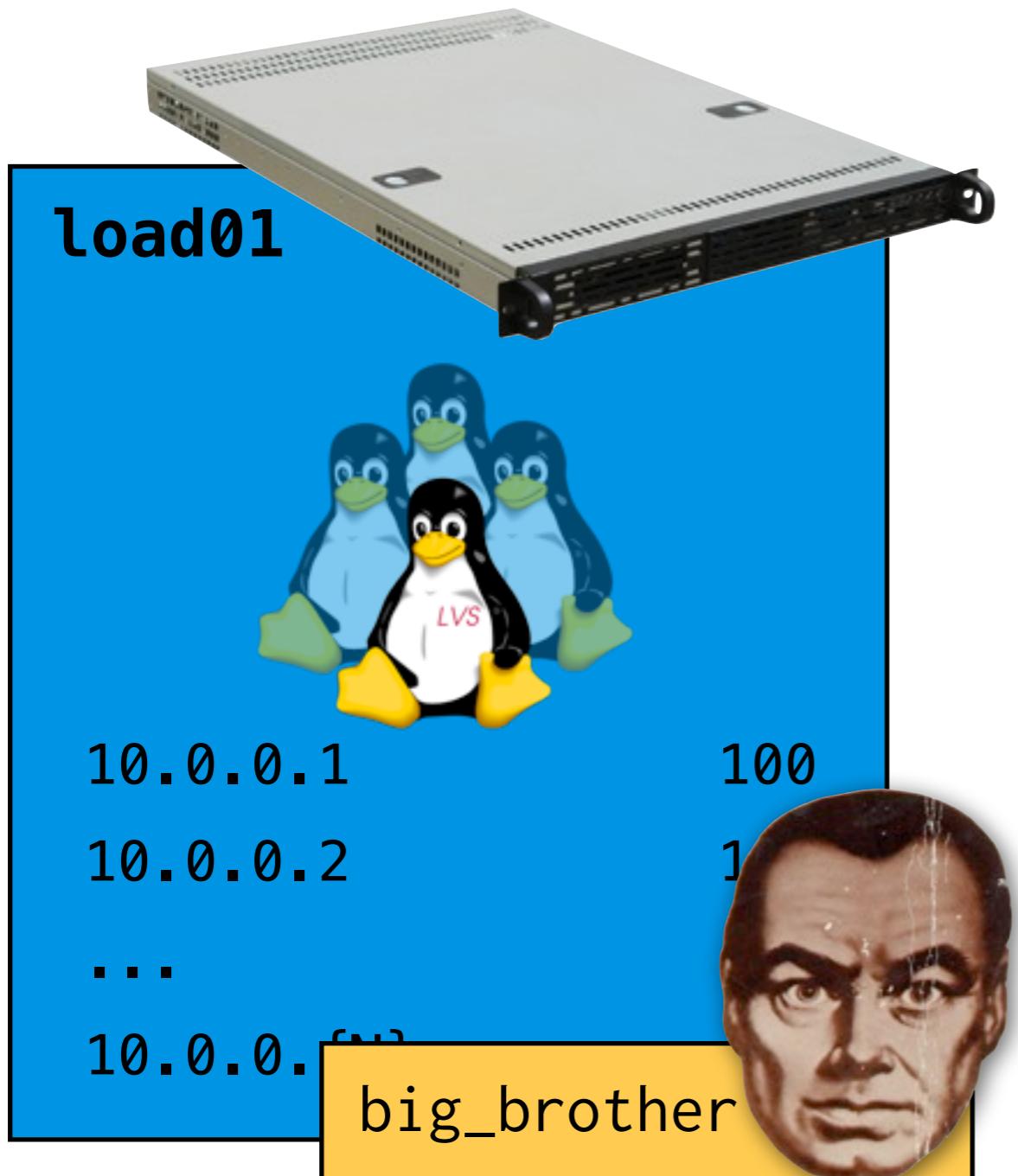
**LITMUS WILL ANSWER
BUT
WHO WILL ASK?**



big_brother



[braintree/big_brother](#)



MONITORS LITMUS

UPDATES IPVS

IT'S SIMPLE, REALLY



```
while true
  health = `curl node/app/status \
    | grep Health \
    | awk '{print $2}'` \
`ipvsadm --edit-server --weight #{health}`
sleep 2
end
```

CONFIG, BROTHER

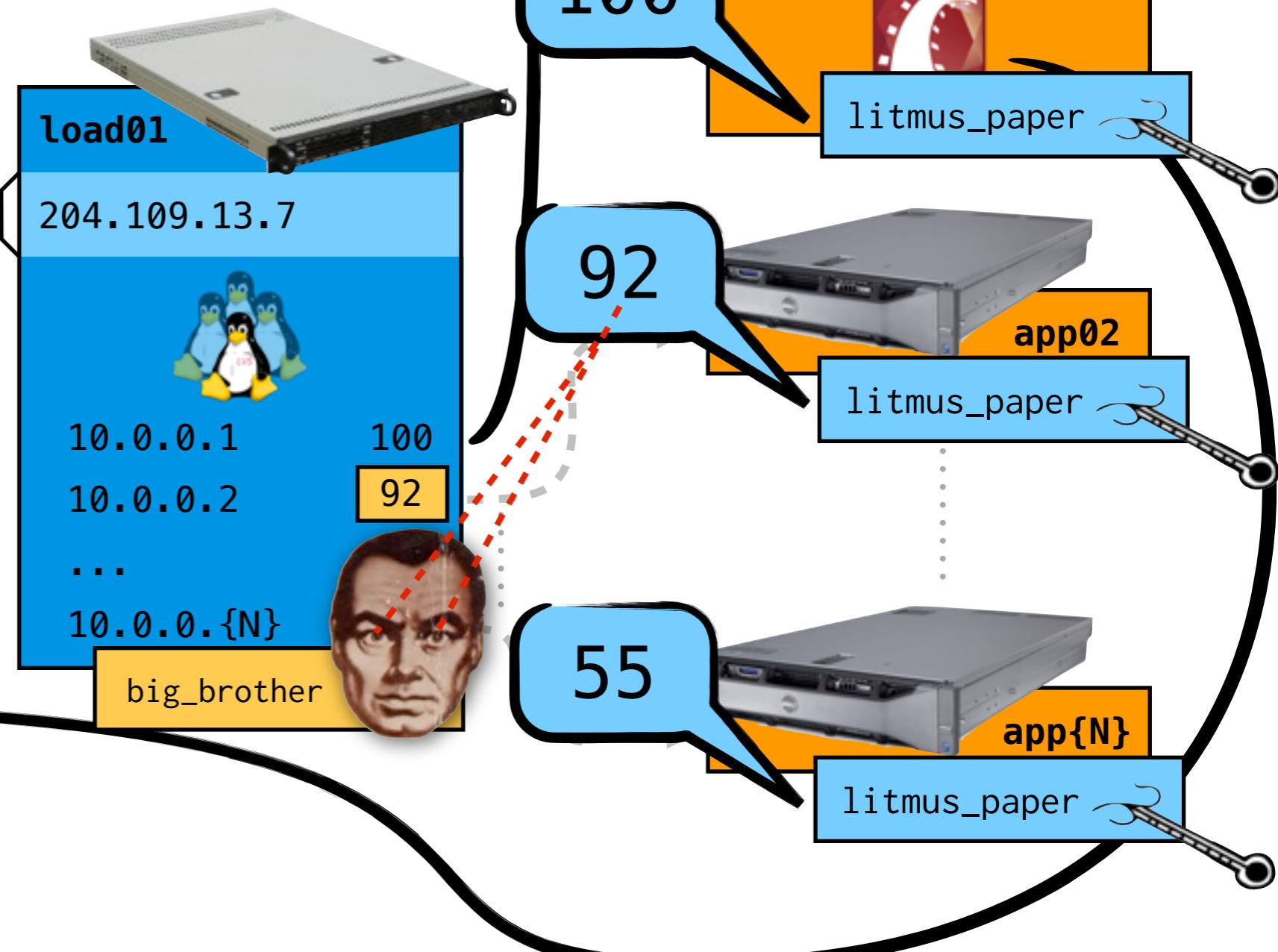
```
webapp:  
    checkInterval: 2000  
    scheduler: wlc  
    fwmark: 7  
nodes:  
- address: 10.0.0.1  
  port: 80  
  path: /webapp/status  
- address: 10.0.0.2  
  port: 80  
  path: /webapp/status
```



BIG_BROTHER_IS WATCHING



POST /transactions





**WHAT CAN
big_brother
DO FOR
YOU?**

ADOLPH ZUKOR AND JESSE L. LASKY PRESENT

ZANE GREY'S THE THUNDERING HERD

WITH JACK HOLT, LOIS WILSON

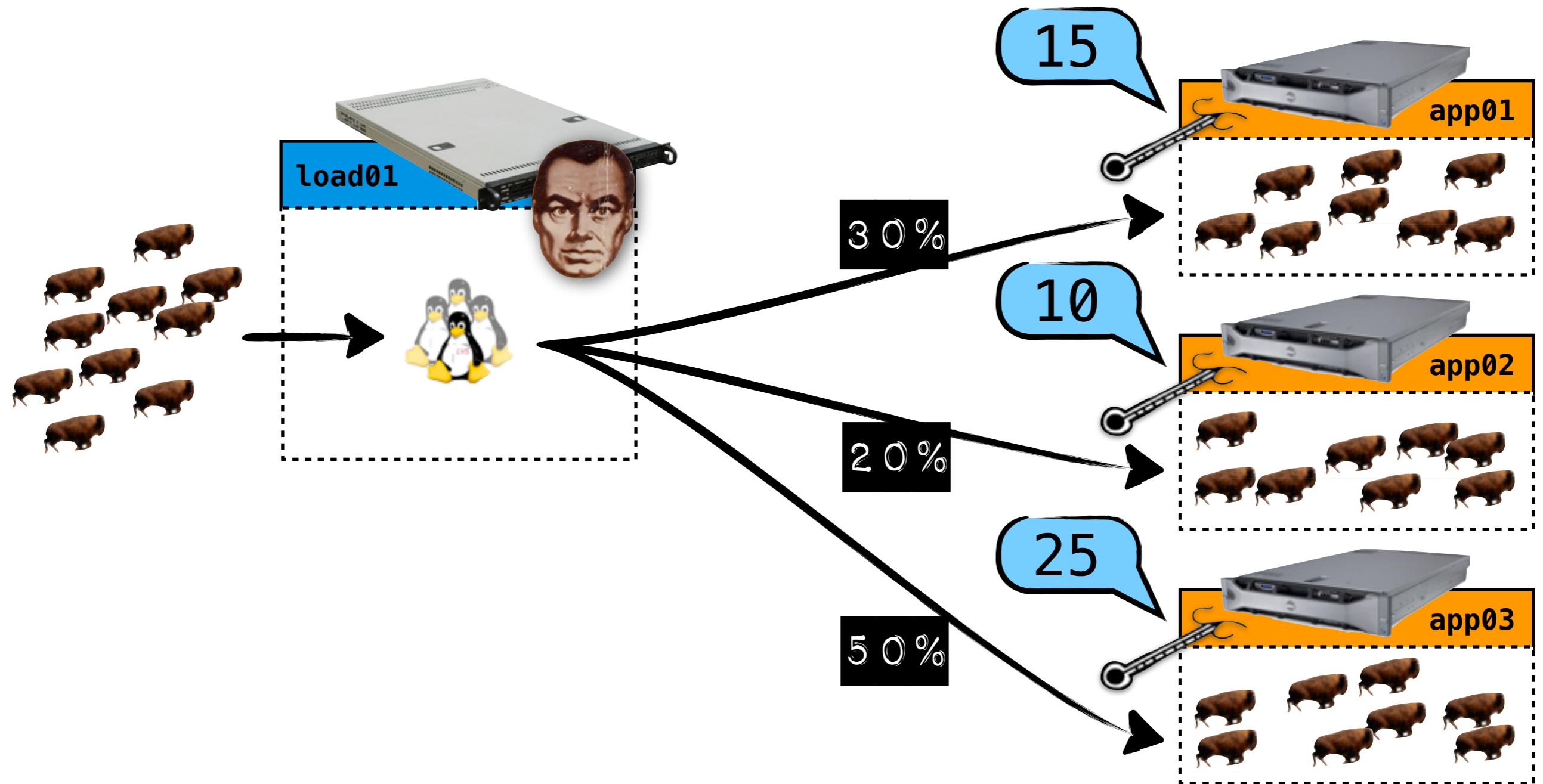
NOAH BEERY, RAYMOND HATTON

SCREEN PLAY BY LUCIEN HUBBARD • DIRECTED BY WILLIAM HOWARD

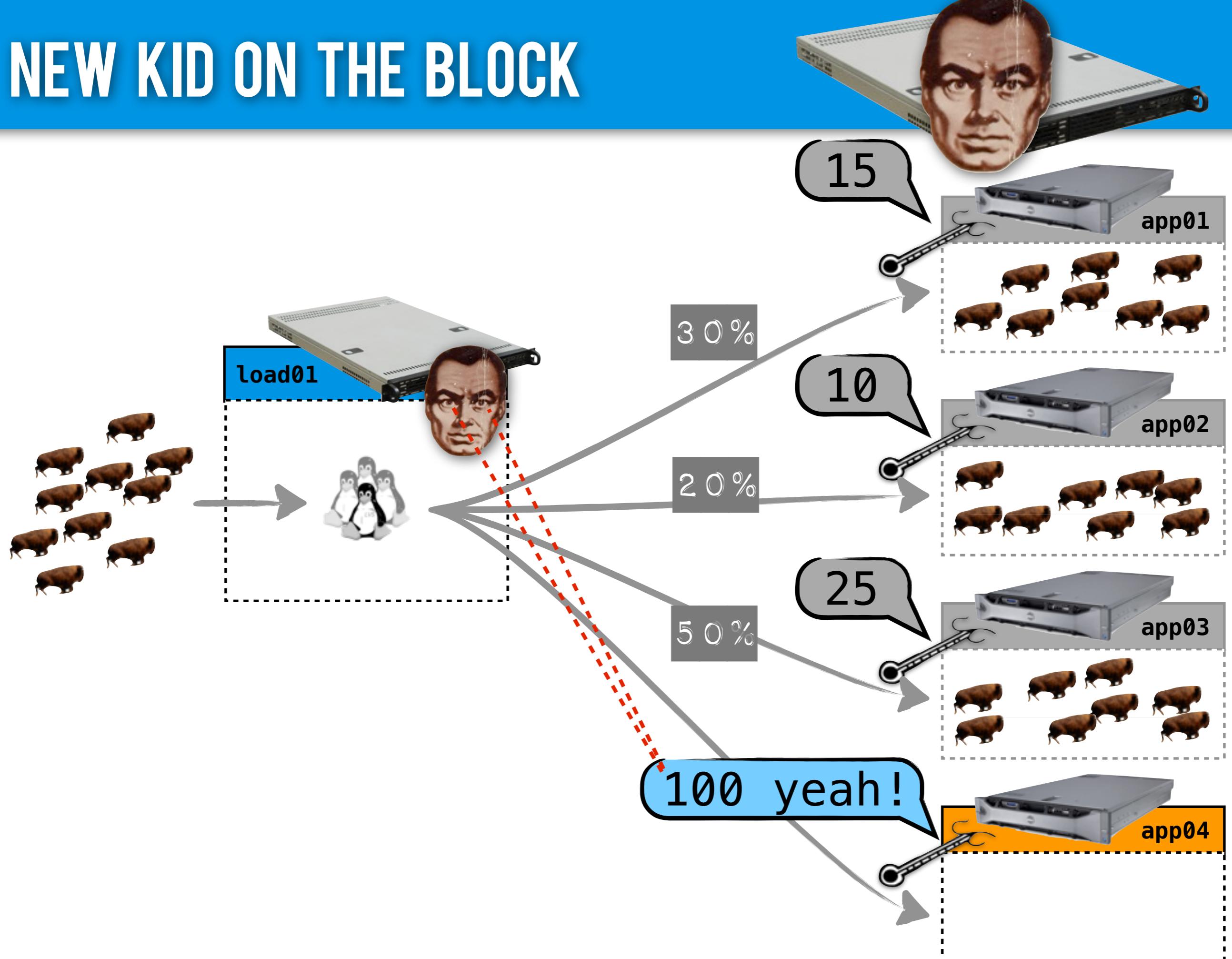


A Paramount Picture
PRODUCED BY FAMOUS PLAYERS - LASKY CORP.

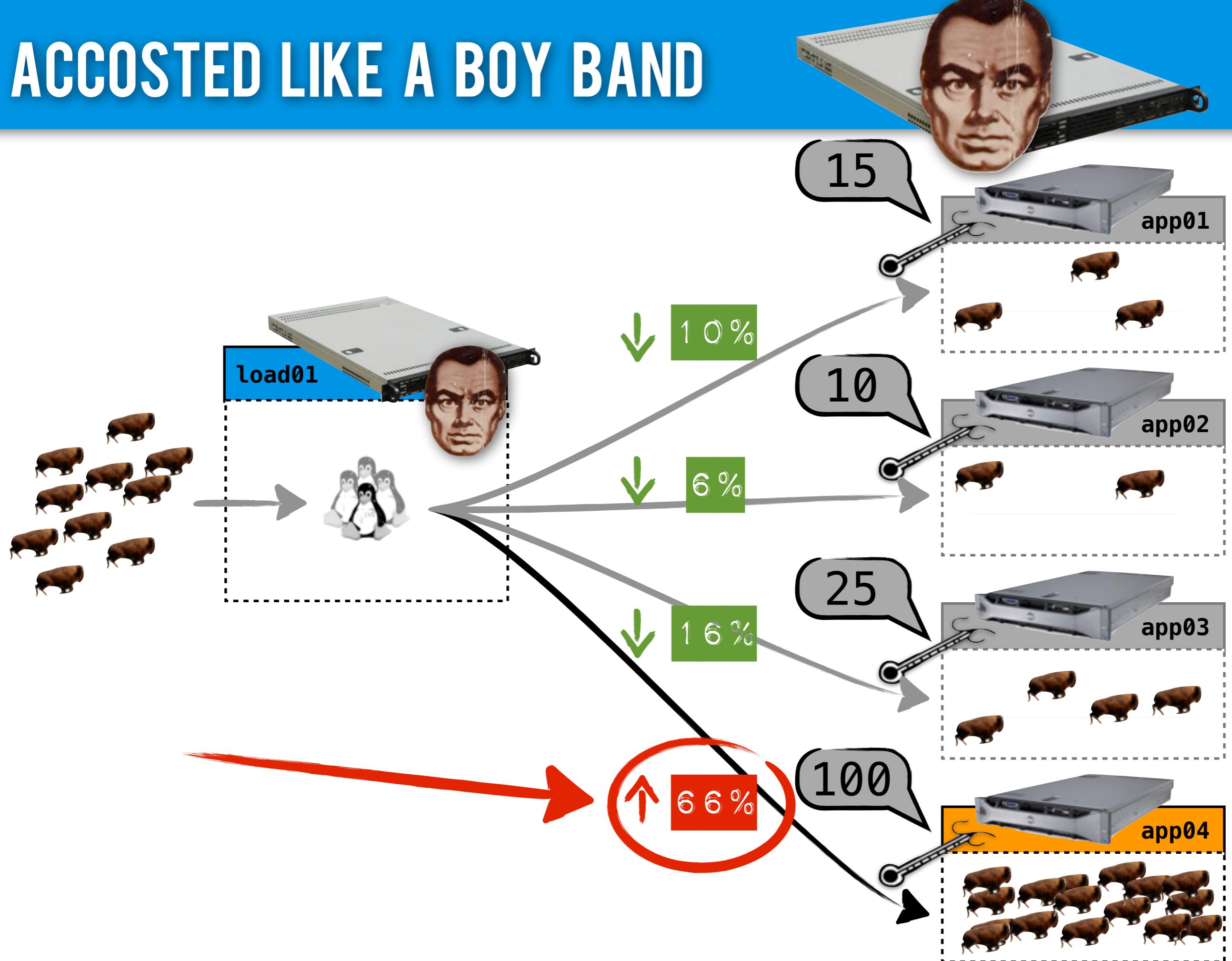
BALANCING BY HEALTH



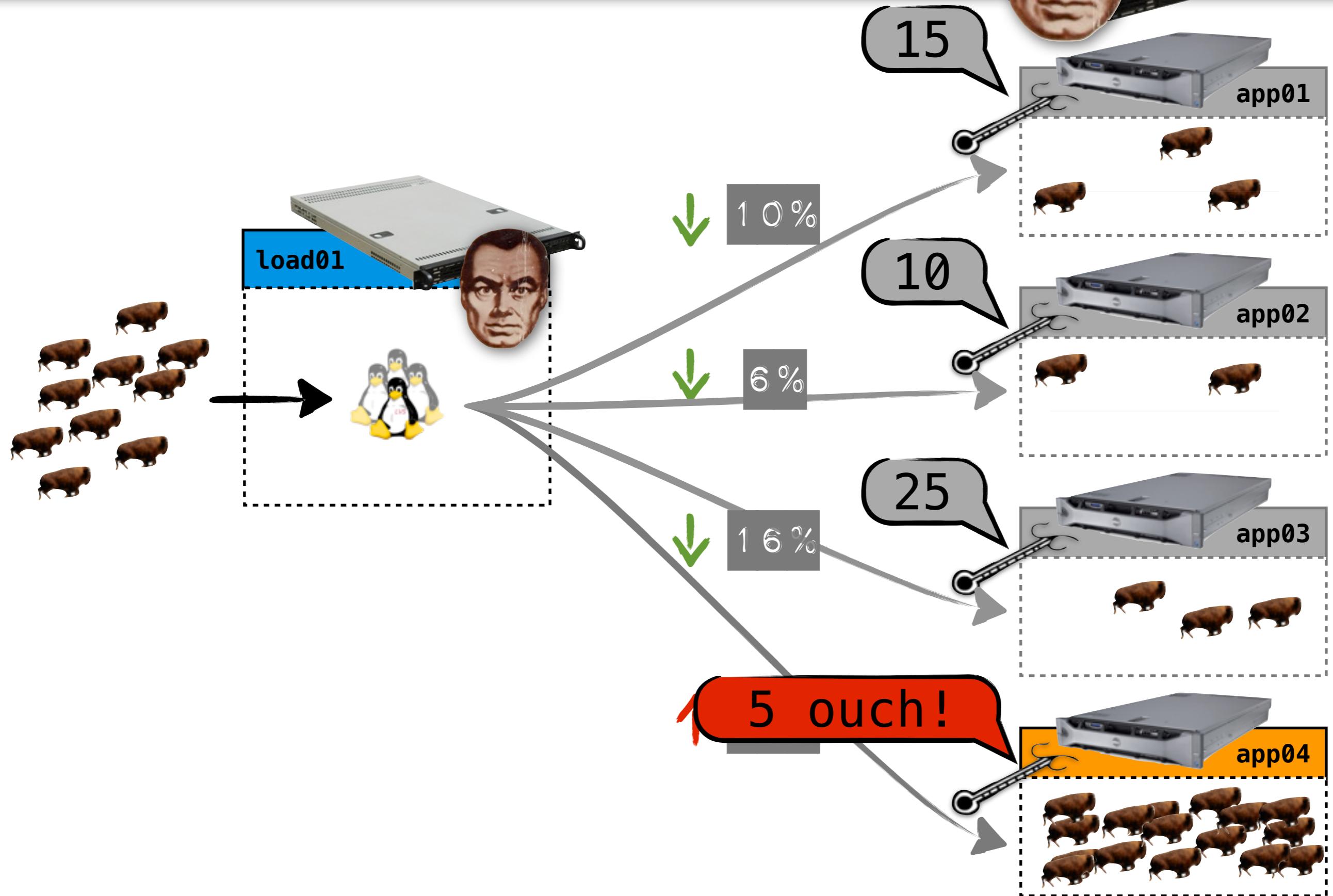
NEW KID ON THE BLOCK



ACCOSTED LIKE A BOY BAND



ACCOSTED LIKE A BOY BAND



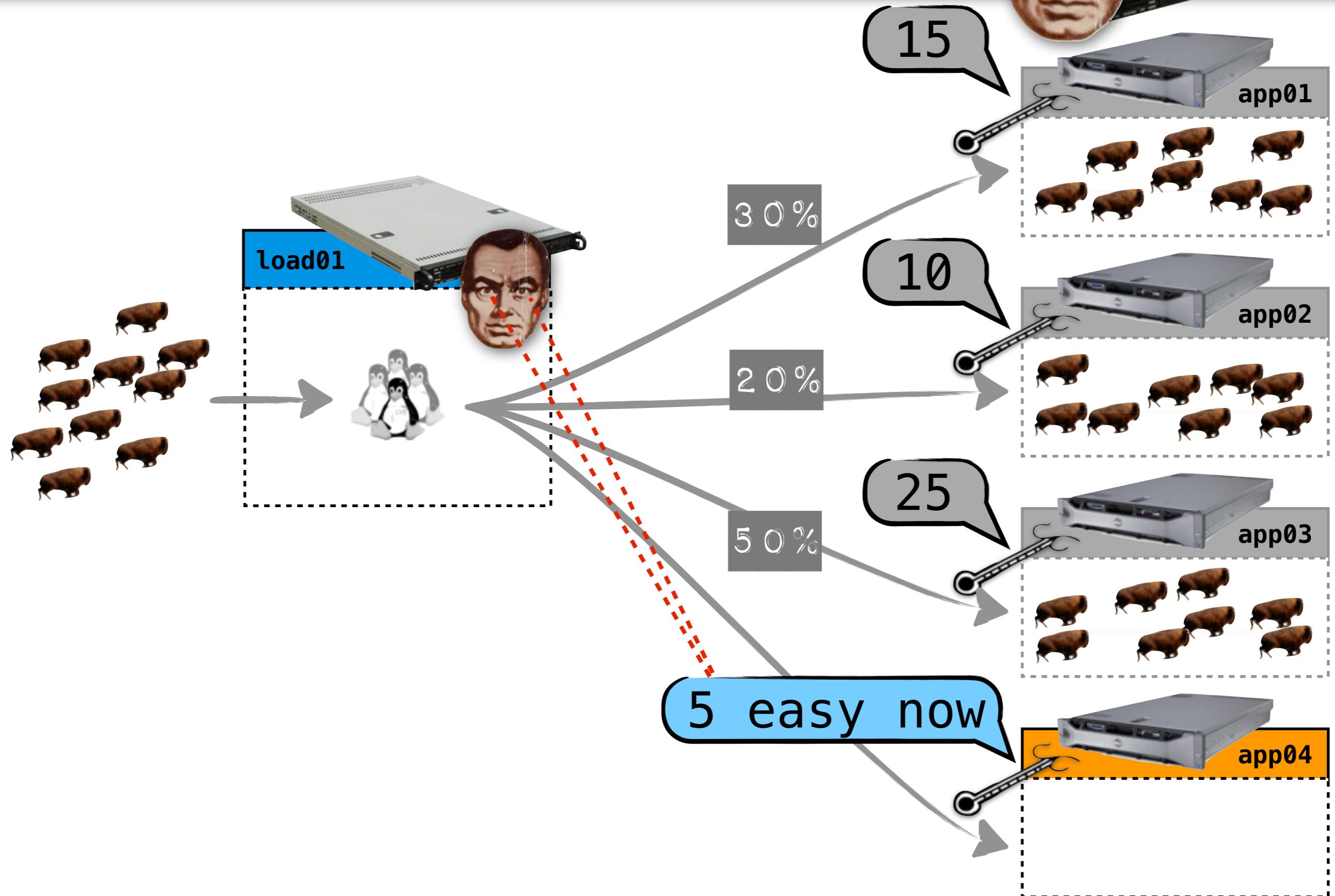
CONFIG, BROTHER

```
webapp:  
    checkInterval: 2000  
    scheduler: wlc  
    fwmark: 7  
    ramp_up_time: 120  
nodes:  
    - address: 10.0.0.1  
      port: 80  
      path: /webapp/status  
    - address: 10.0.0.2  
      port: 80  
      path: /webapp/status
```

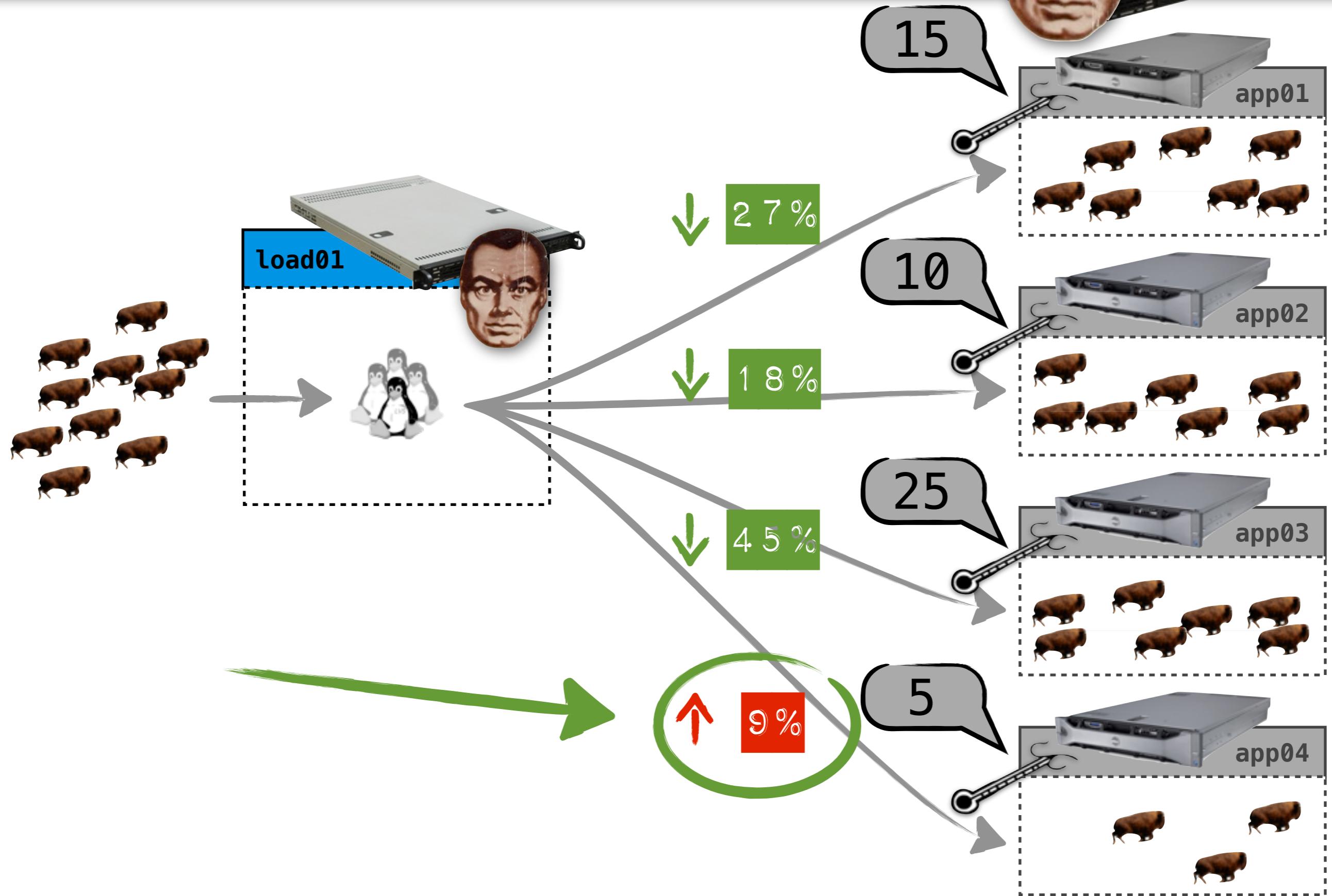


TRY THIS

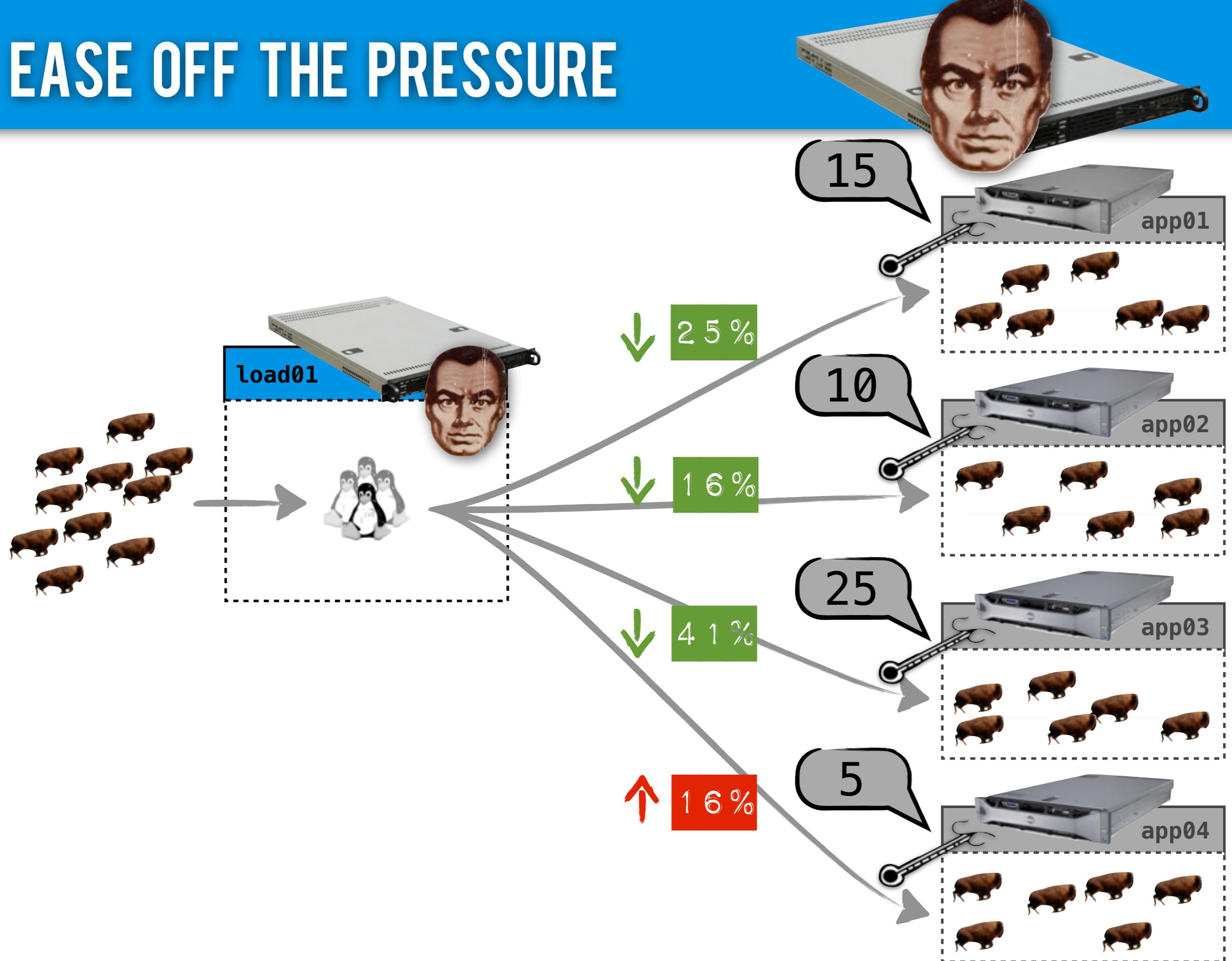
HUMBLE KID ON THE BLOCK



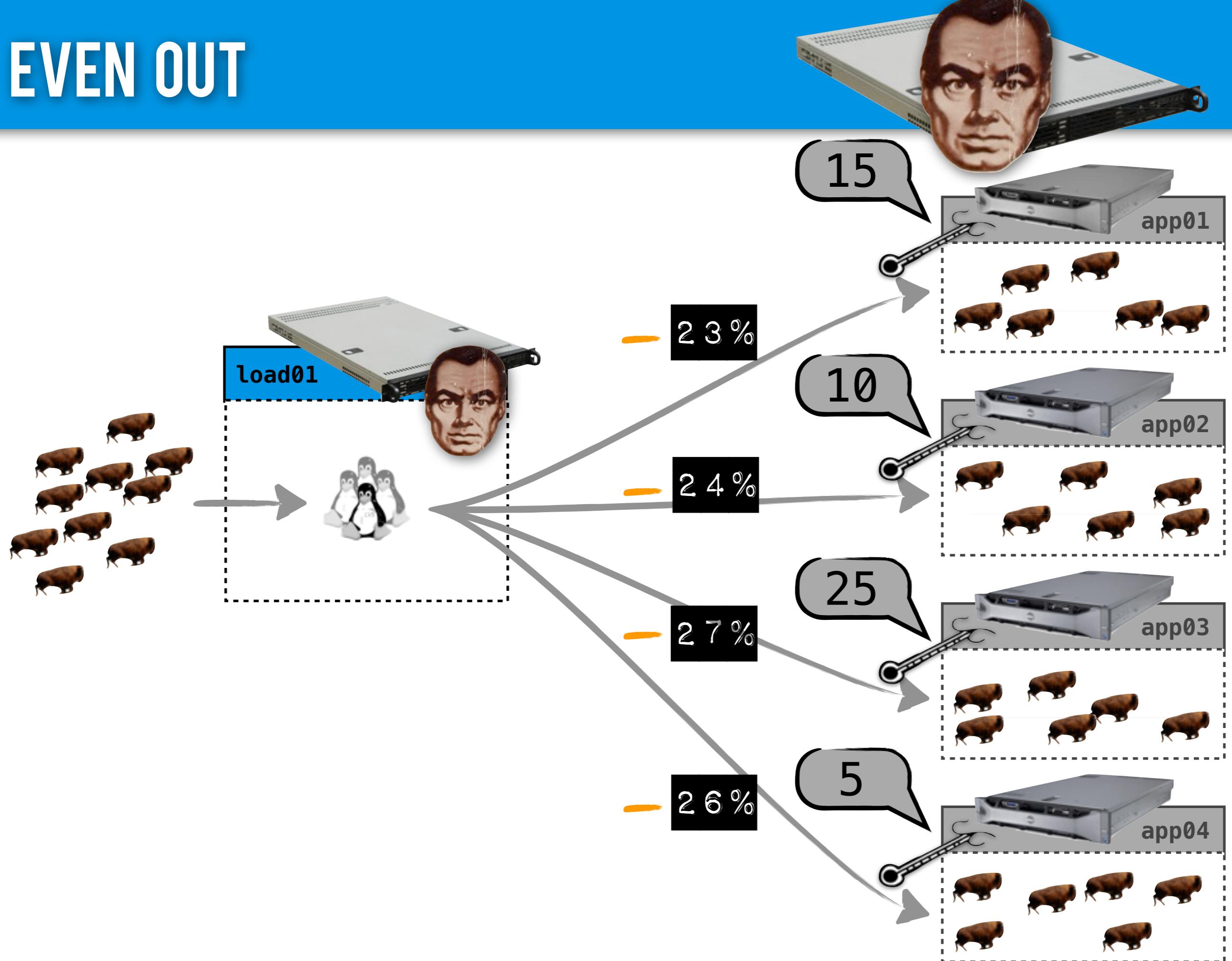
EASE OFF THE PRESSURE



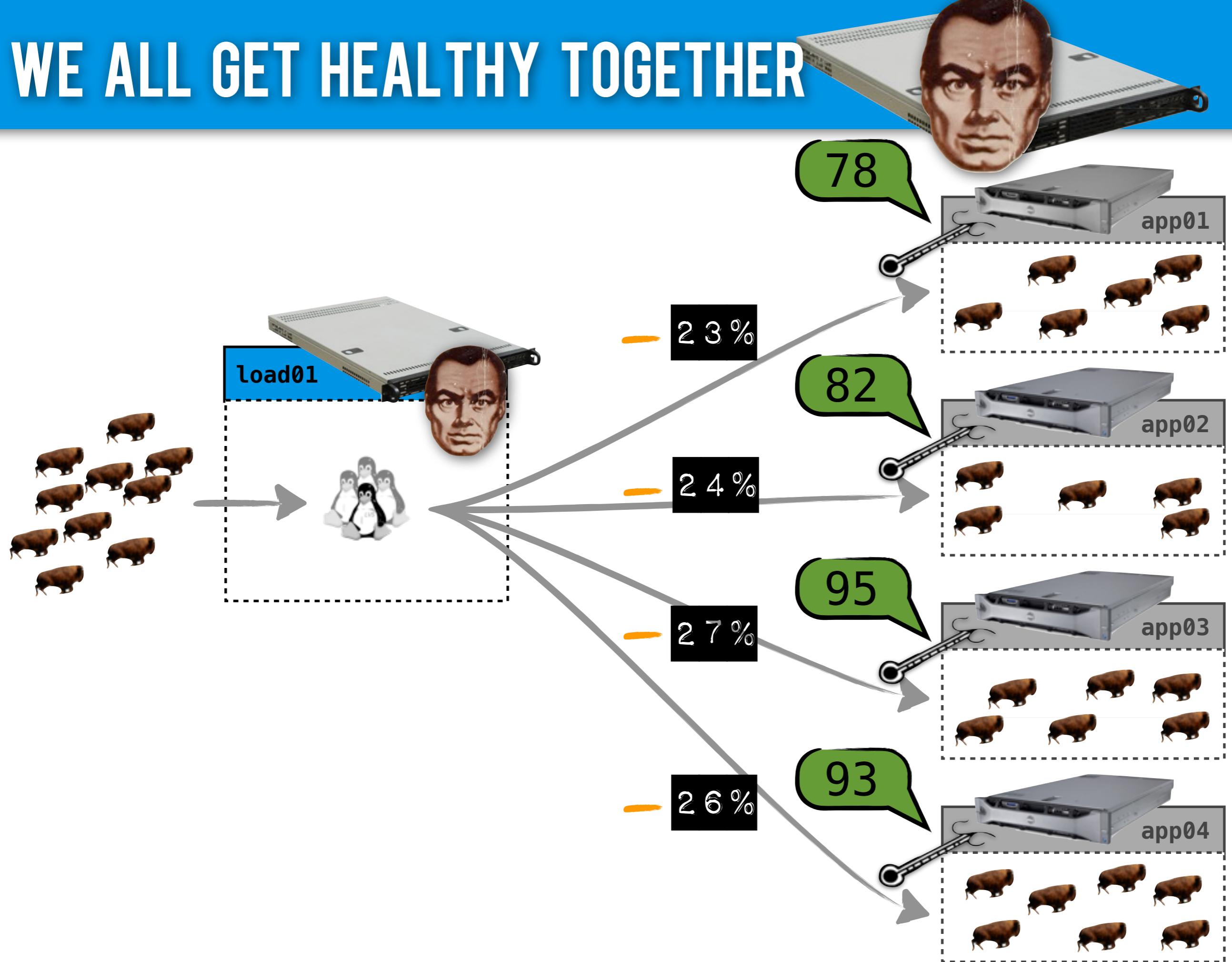
EASE OFF THE PRESSURE



EVEN OUT



WE ALL GET HEALTHY TOGETHER

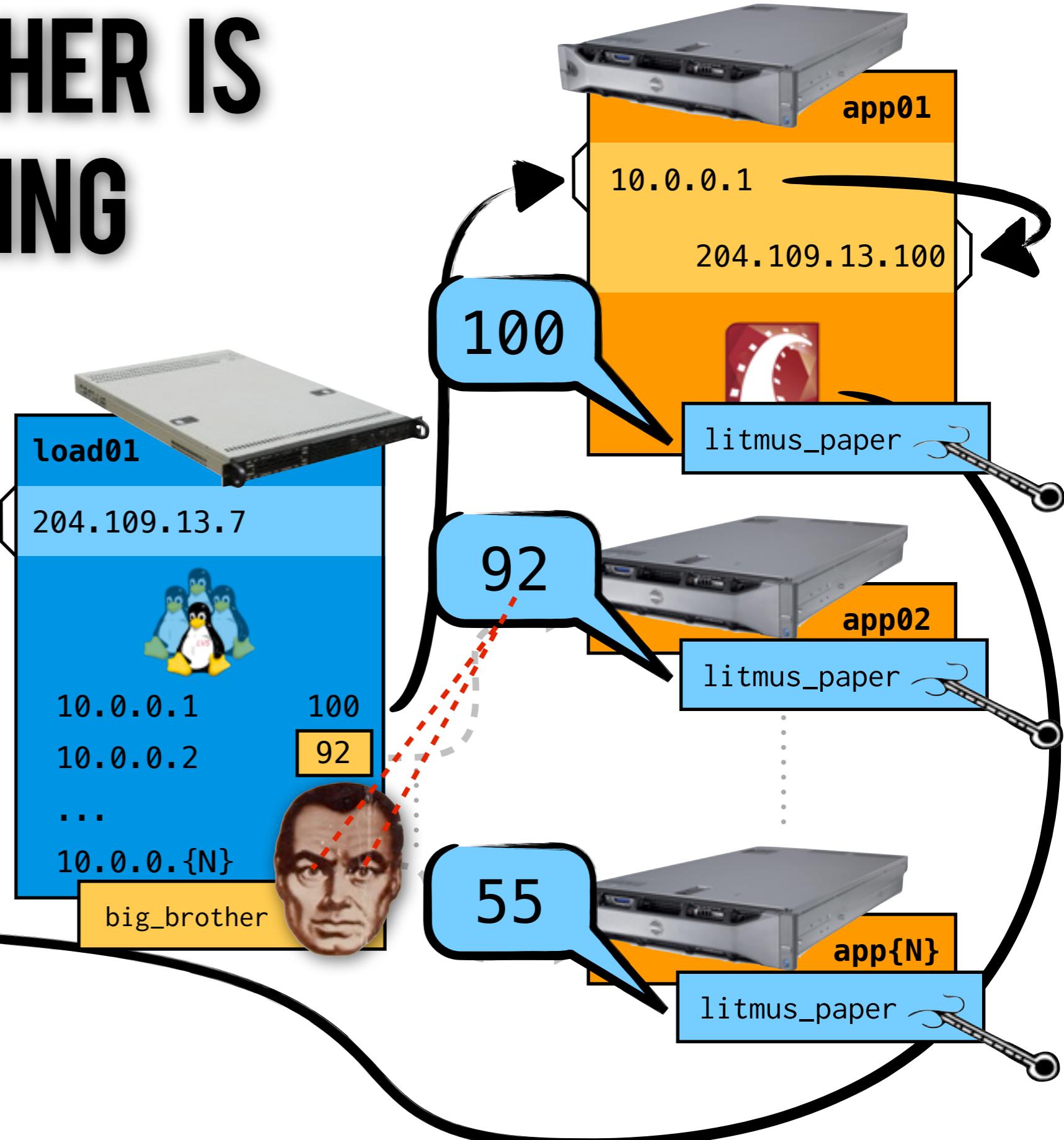


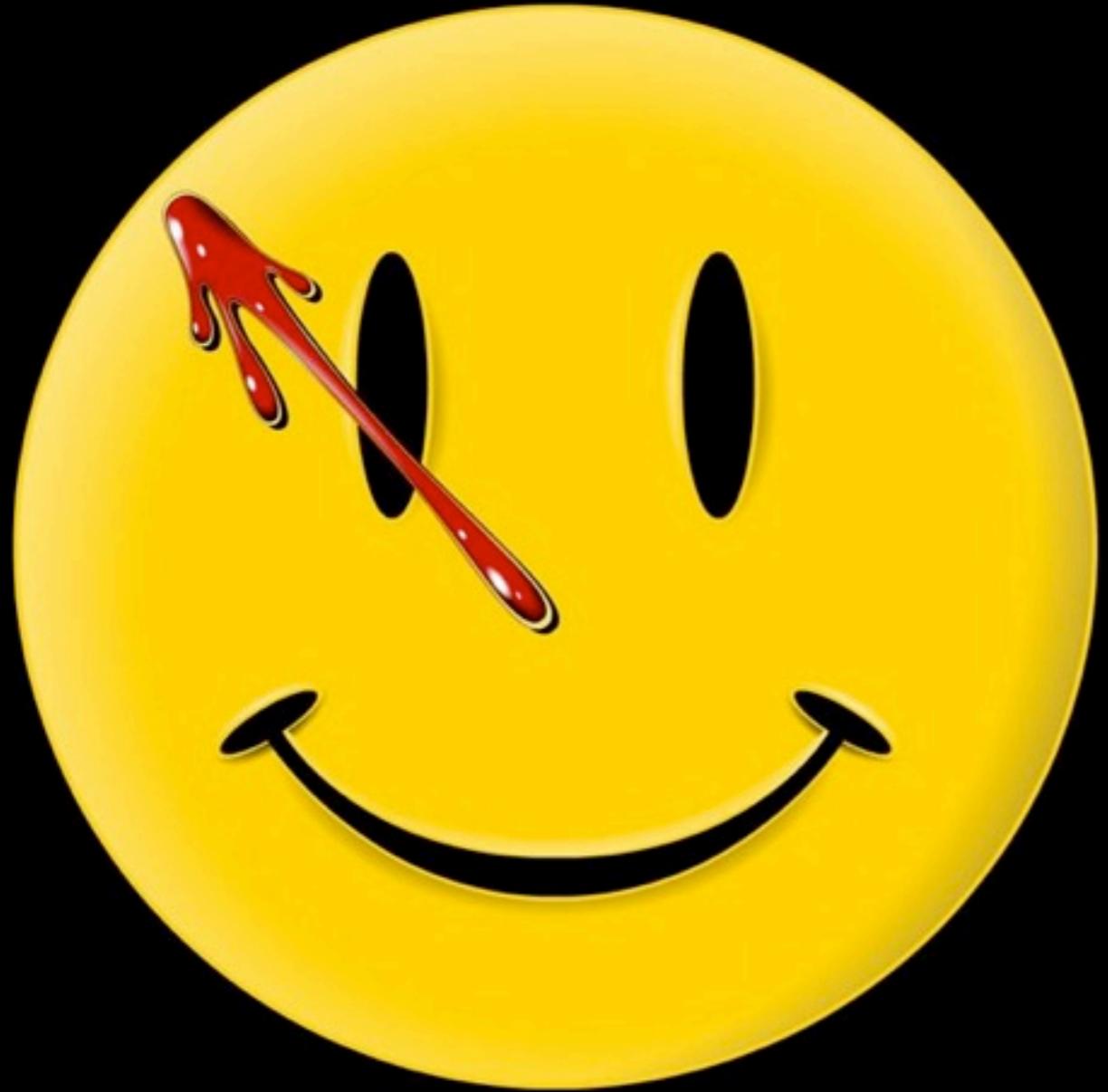
BIG_BROTHER_IS_WATCHING



POST /transactions

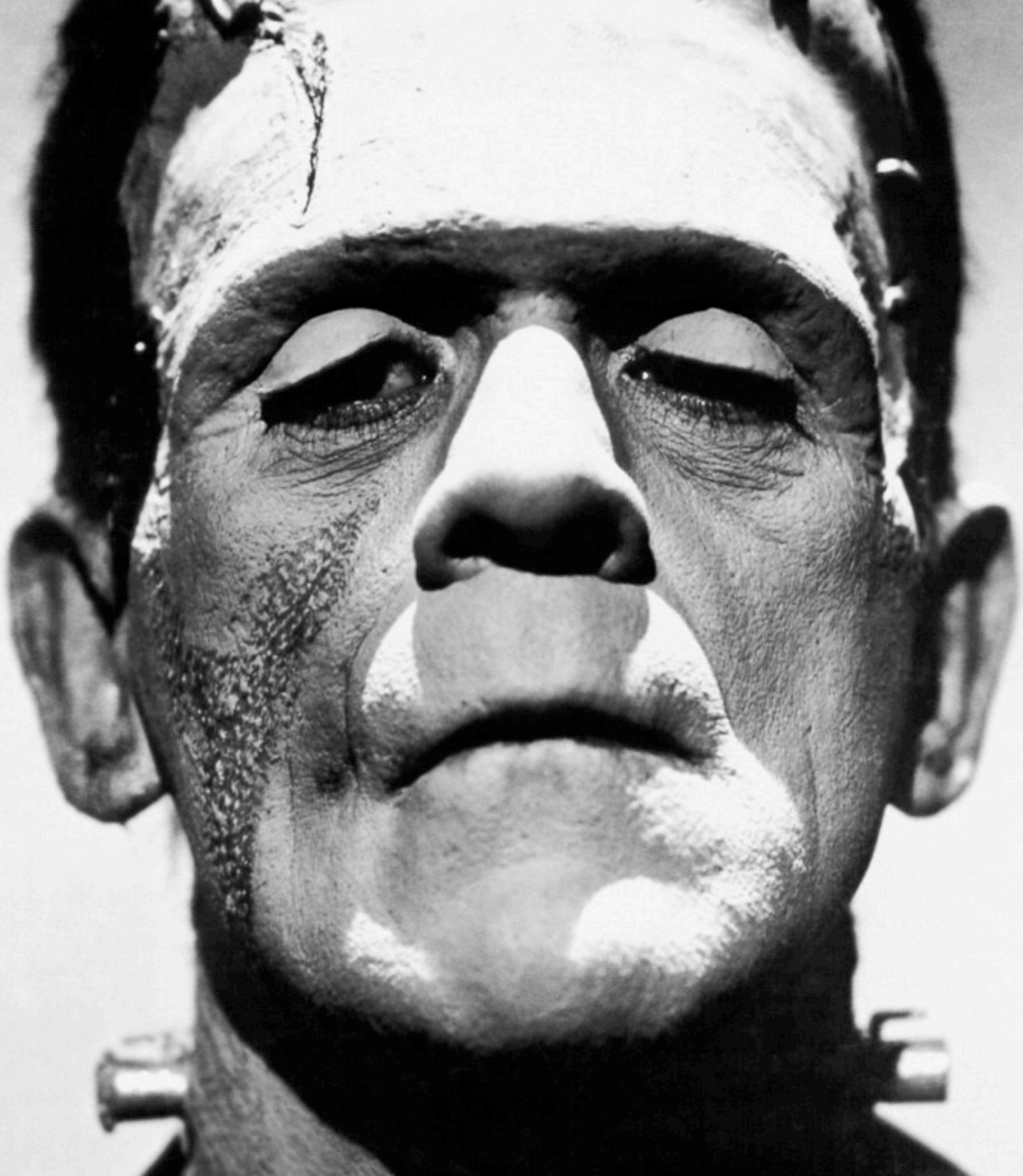
201 Created



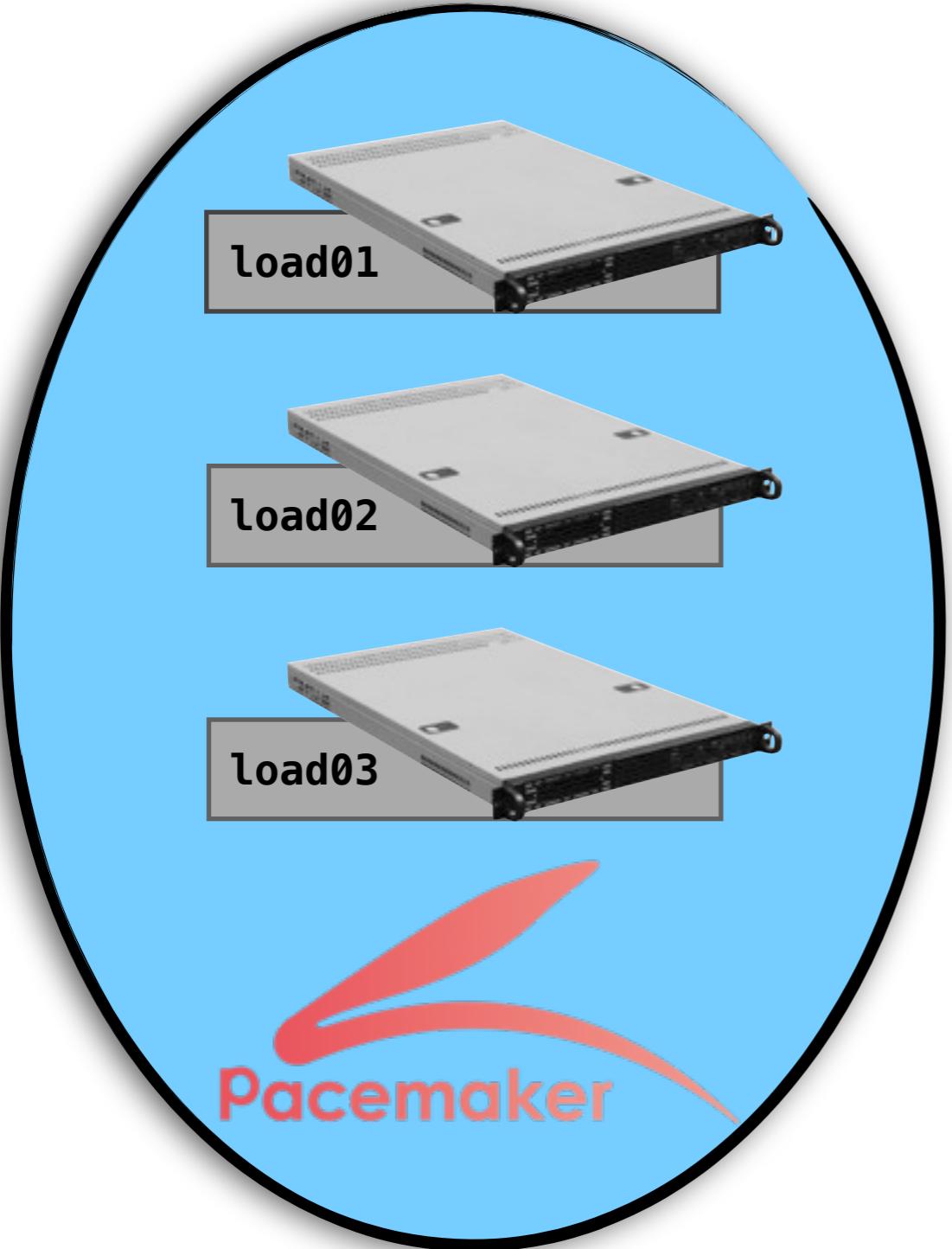


WHO LOAD
BALANCES
THE LOAD
BALANCERS
?









**MANAGES
RESOURCES
ACROSS
A
CLUSTER**

**RESOURCE == OPEN
CLUSTER
FRAMEWORK
(OCF)**

OCF SCRIPTS



/usr/lib/ocf/resource.d/braintree/**ocf_big_brother**

<monitor|start | stop>

OCF MONITOR



/usr/lib/ocf/resource.d/braintree/ocf_big_brother

<monitor|start|stop>

```
$ curl localhost:9292/cluster/app  
Running: true
```

OCF MONITOR



/usr/lib/ocf/resource.d/braintree/ocf_big_brother

<monitor|start|stop>

```
$ curl -XPUT localhost:9292/cluster/app  
0K
```

OCF MONITOR



/usr/lib/ocf/resource.d/braintree/ocf_big_brother

<monitor|start|stop>

```
$ curl -XDELETE localhost:9292/cluster/app  
0K
```

RESOURCE ==

VIRTUAL IP(S)
+
IPVS CLUSTER

IPaddr2

XMHELL



```
<group description="Braintree Webapp" id="webapp_group">
  <primitive class="ocf" id="ipvs_webapp" provider="braintree" type="ocf_big_brother">
    <instance_attributes id="ipvs_webapp_ia">
      <nvpair id="ipvs_monitor_webapp_cluster" name="cluster" value="webapp"/>
    </instance_attributes>
    <operations>
      <op id="ipvs_webapp_op_start" interval="0" name="start" timeout="20s"/>
      <op id="ipvs_webapp_op_stop" interval="0" name="stop" timeout="40s"/>
      <op id="ipvs_webapp_op_monitor" interval="61s" name="monitor" timeout="30s"/>
    </operations>
  </primitive>
  <primitive class="ocf" id="ip_204.109.13.7" provider="heartbeat" type="IPAddr2">
    <instance_attributes id="ip_204.109.13.7_ia">
      <nvpair id="ip_204.109.13.7_ip" name="ip" value="204.109.13.7"/>
      <nvpair id="ip_204.109.13.7_nm" name="cidr_netmask" value="32"/>
      <nvpair id="ip_204.109.13.7_nic" name="nic" value="eth70"/>
    </instance_attributes>
    <operations>
      <op id="ip_204.109.13.7_op_start" interval="0" name="start" timeout="30s"/>
      <op id="ip_204.109.13.7_op_stop" interval="0" name="stop" timeout="90s"/>
      <op id="ip_204.109.13.7_op_monitor" interval="61s" name="monitor" timeout="30s"/>
    </operations>
  </primitive>
</group>
```

GROUPS FLOCK TOGETHER



```
<group description="Braintree Webapp" id="webapp_group">
  <primitive class="ocf" id="ipvs_webapp" provider="braintree" type="ocf_big_brother">
    <instance_attributes id="ipvs_webapp_ia">
      <nvpair id="ipvs_monitor_webapp_cluster" name="cluster" value="webapp"/>
    </instance_attributes>
    <operations>
      <op id="ipvs_webapp_op_start" interval="0" name="start" timeout="20s"/>
      <op id="ipvs_webapp_op_stop" interval="0" name="stop" timeout="40s"/>
      <op id="ipvs_webapp_op_monitor" interval="61s" name="monitor" timeout="30s"/>
    </operations>
  </primitive>
  <primitive class="ocf" id="ip_204.109.13.7" provider="heartbeat" type="IPAddr2">
    <instance_attributes id="ip_204.109.13.7_ia">
      <nvpair id="ip_204.109.13.7_ip" name="ip" value="204.109.13.7"/>
      <nvpair id="ip_204.109.13.7_nm" name="cidr_netmask" value="32"/>
      <nvpair id="ip_204.109.13.7_nic" name="nic" value="eth70"/>
    </instance_attributes>
    <operations>
      <op id="ip_204.109.13.7_op_start" interval="0" name="start" timeout="30s"/>
      <op id="ip_204.109.13.7_op_stop" interval="0" name="stop" timeout="90s"/>
      <op id="ip_204.109.13.7_op_monitor" interval="61s" name="monitor" timeout="30s"/>
    </operations>
  </primitive>
</group>
```

THE IPVS RESOURCE



```
<group description="Braintree Webapp" id="webapp_group">
  <primitive class="ocf" id="ipvs_webapp" provider="braintree" type="ocf_big_brother">
    <instance_attributes id="ipvs_webapp_ia">
      <nvpair id="ipvs_monitor_webapp_cluster" name="cluster" value="webapp"/>
    </instance_attributes>
    <operations>
      <op id="ipvs_webapp_op_start" interval="0" name="start" timeout="20s"/>
      <op id="ipvs_webapp_op_stop" interval="0" name="stop" timeout="40s"/>
      <op id="ipvs_webapp_op_monitor" interval="61s" name="monitor" timeout="30s"/>
    </operations>
  </primitive>
  <primitive class="ocf" id="ip_204.109.13.7" provider="heartbeat" type="IPAddr2">
    <instance_attributes id="ip_204.109.13.7_ia">
      <nvpair id="ip_204.109.13.7_ip" name="ip" value="204.109.13.7"/>
      <nvpair id="ip_204.109.13.7_nm" name="cidr_netmask" value="32"/>
      <nvpair id="ip_204.109.13.7_nic" name="nic" value="eth70"/>
    </instance_attributes>
    <operations>
      <op id="ip_204.109.13.7_op_start" interval="0" name="start" timeout="30s"/>
      <op id="ip_204.109.13.7_op_stop" interval="0" name="stop" timeout="90s"/>
      <op id="ip_204.109.13.7_op_monitor" interval="61s" name="monitor" timeout="30s"/>
    </operations>
  </primitive>
</group>
```

THE IPVS IMPORTANT BITS



```
<group description="Braintree Webapp" id="webapp_group">
  <primitive class="ocf" id="ipvs_webapp" provider="braintree" type="ocf_big_brother">
    <instance_attributes id="ipvs_webapp_ia">
      <nvpair id="ipvs_monitor_webapp_cluster" name="cluster" value="webapp"/>
    </instance_attributes>
    <operations>
      <op id="ipvs_webapp_op_start" interval="0" name="start" timeout="20s"/>
      <op id="ipvs_webapp_op_stop" interval="0" name="stop" timeout="40s"/>
      <op id="ipvs_webapp_op_monitor" interval="61s" name="monitor" timeout="30s"/>
    </operations>
  </primitive>
  <primitive class="ocf" id="ip_204.109.13.7" provider="heartbeat" type="IPAddr2">
    <instance_attributes id="ip_204.109.13.7_ia">
      <nvpair id="ip_204.109.13.7_ip" name="ip" value="204.109.13.7"/>
      <nvpair id="ip_204.109.13.7_nm" name="cidr_netmask" value="32"/>
      <nvpair id="ip_204.109.13.7_nic" name="nic" value="eth70"/>
    </instance_attributes>
    <operations>
      <op id="ip_204.109.13.7_op_start" interval="0" name="start" timeout="30s"/>
      <op id="ip_204.109.13.7_op_stop" interval="0" name="stop" timeout="90s"/>
      <op id="ip_204.109.13.7_op_monitor" interval="61s" name="monitor" timeout="30s"/>
    </operations>
  </primitive>
</group>
```

THE IPADDR RESOURCE



```
<group description="Braintree Webapp" id="webapp_group">
  <primitive class="ocf" id="ipvs_webapp" provider="braintree" type="ocf_big_brother">
    <instance_attributes id="ipvs_webapp_ia">
      <nvpair id="ipvs_monitor_webapp_cluster" name="cluster" value="webapp"/>
    </instance_attributes>
    <operations>
      <op id="ipvs_webapp_op_start" interval="0" name="start" timeout="20s"/>
      <op id="ipvs_webapp_op_stop" interval="0" name="stop" timeout="40s"/>
      <op id="ipvs_webapp_op_monitor" interval="61s" name="monitor" timeout="30s"/>
    </operations>
  </primitive>
  <primitive class="ocf" id="ip_204.109.13.7" provider="heartbeat" type="IPAddr2">
    <instance_attributes id="ip_204.109.13.7_ia">
      <nvpair id="ip_204.109.13.7_ip" name="ip" value="204.109.13.7"/>
      <nvpair id="ip_204.109.13.7_nm" name="cidr_netmask" value="32"/>
      <nvpair id="ip_204.109.13.7_nic" name="nic" value="eth70"/>
    </instance_attributes>
    <operations>
      <op id="ip_204.109.13.7_op_start" interval="0" name="start" timeout="30s"/>
      <op id="ip_204.109.13.7_op_stop" interval="0" name="stop" timeout="90s"/>
      <op id="ip_204.109.13.7_op_monitor" interval="61s" name="monitor" timeout="30s"/>
    </operations>
  </primitive>
</group>
```

THE IPADDR IMPORTANT BITS



```
<group description="Braintree Webapp" id="webapp_group">
  <primitive class="ocf" id="ipvs_webapp" provider="braintree" type="ocf_big_brother">
    <instance_attributes id="ipvs_webapp_ia">
      <nvpair id="ipvs_monitor_webapp_cluster" name="cluster" value="webapp"/>
    </instance_attributes>
    <operations>
      <op id="ipvs_webapp_op_start" interval="0" name="start" timeout="20s"/>
      <op id="ipvs_webapp_op_stop" interval="0" name="stop" timeout="40s"/>
      <op id="ipvs_webapp_op_monitor" interval="61s" name="monitor" timeout="30s"/>
    </operations>
  </primitive>
  <primitive class="ocf" id="ip_204.109.13.7" provider="heartbeat" type="IPAddr2">
    <instance_attributes id="ip_204.109.13.7_ia">
      <nvpair id="ip_204.109.13.7_ip" name="ip" value="204.109.13.7"/>
      <nvpair id="ip_204.109.13.7_nm" name="cidr_netmask" value="32"/>
      <nvpair id="ip_204.109.13.7_nic" name="nic" value="eth70"/>
    </instance_attributes>
    <operations>
      <op id="ip_204.109.13.7_op_start" interval="0" name="start" timeout="30s"/>
      <op id="ip_204.109.13.7_op_stop" interval="0" name="stop" timeout="90s"/>
      <op id="ip_204.109.13.7_op_monitor" interval="61s" name="monitor" timeout="30s"/>
    </operations>
  </primitive>
</group>
```

XMHELL

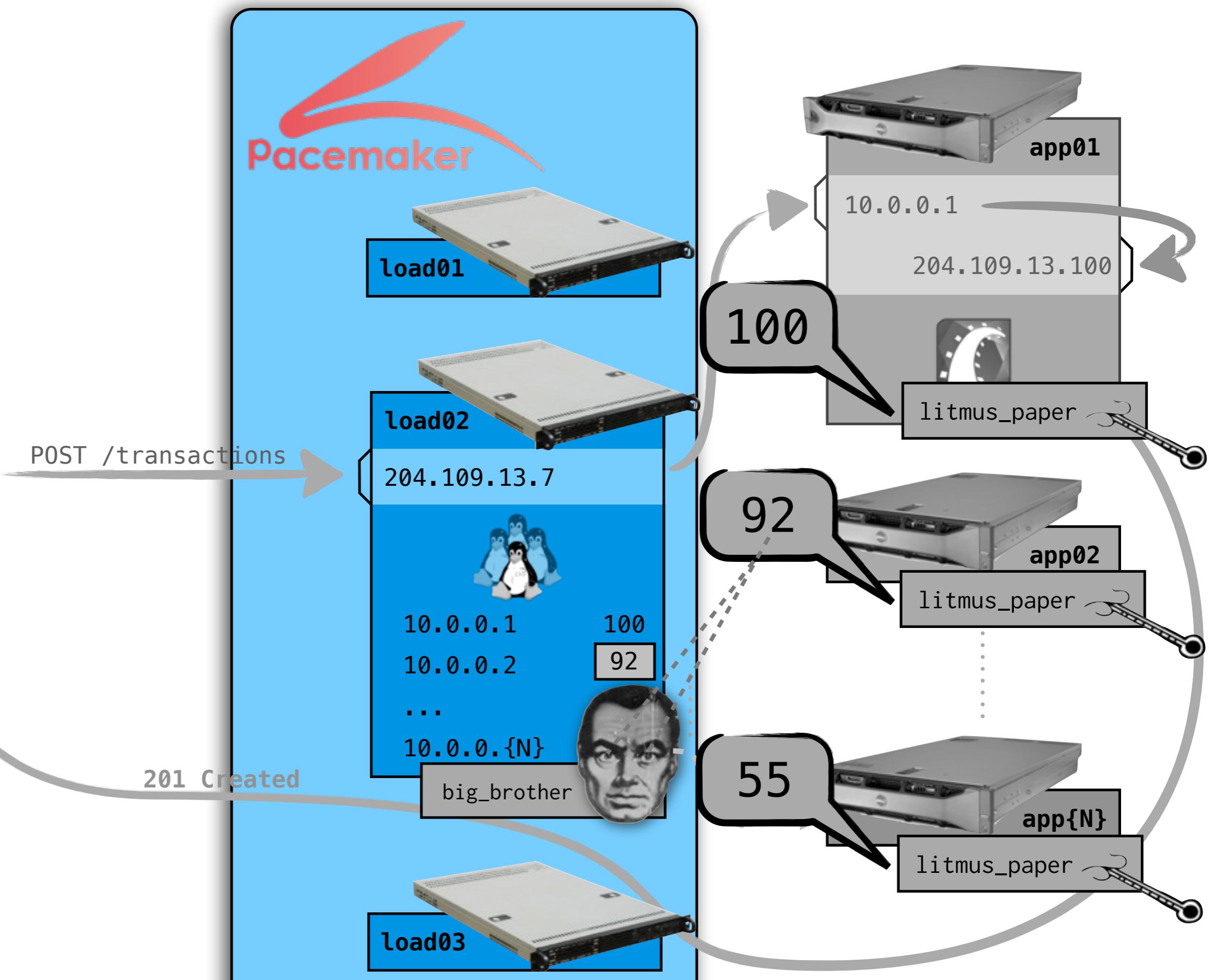


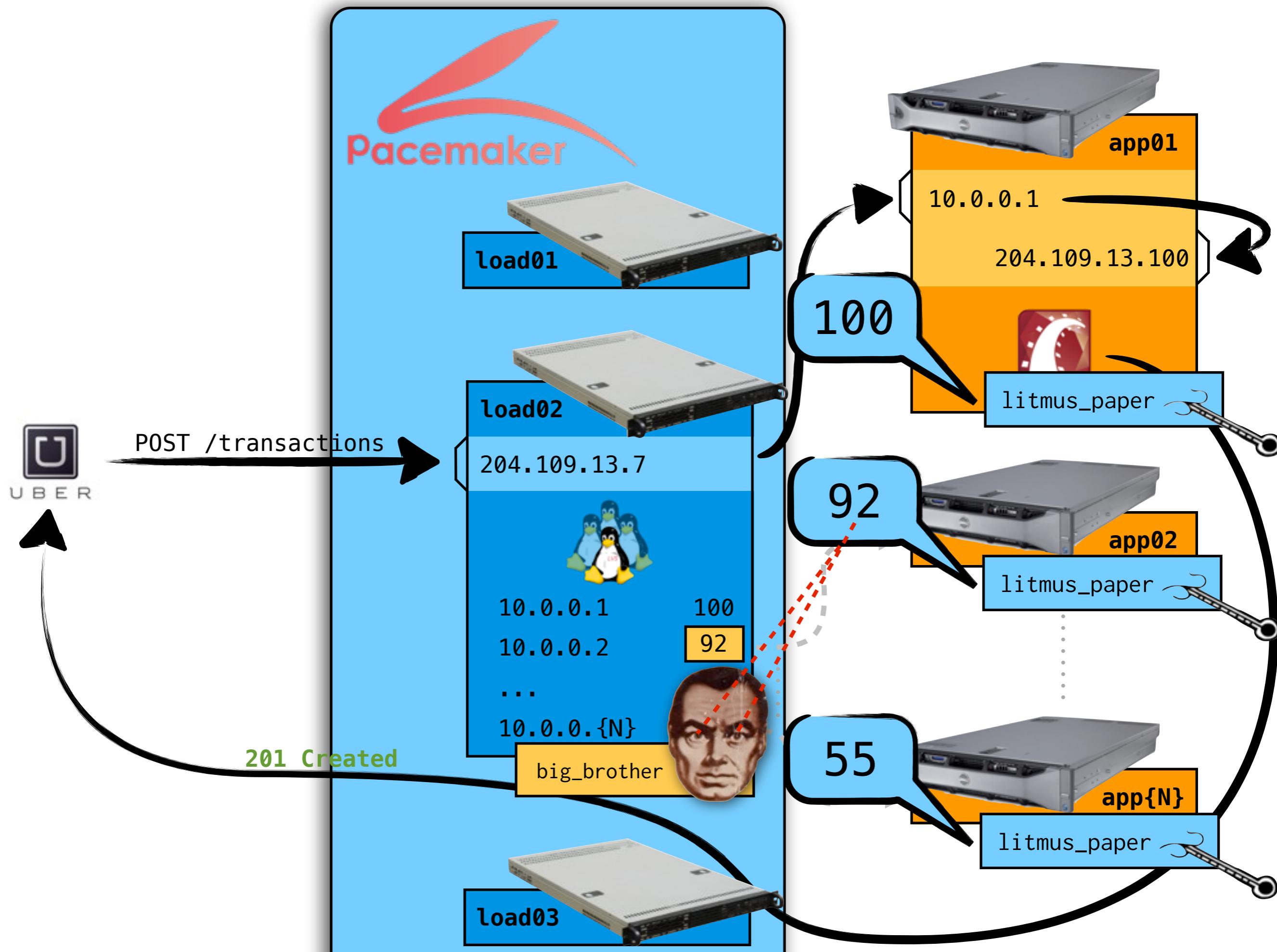
```
<group description="Braintree Webapp" id="webapp_group">
  <primitive class="ocf" id="ipvs_webapp" provider="braintree" type="ocf_big_brother">
    <instance_attributes id="ipvs_webapp_ia">
      <nvpair id="ipvs_monitor_webapp_cluster" name="cluster" value="webapp"/>
    </instance_attributes>
    <operations>
      <op id="ipvs_webapp_op_start" interval="0" name="start" timeout="20s"/>
      <op id="ipvs_webapp_op_stop" interval="0" name="stop" timeout="40s"/>
      <op id="ipvs_webapp_op_monitor" interval="61s" name="monitor" timeout="30s"/>
    </operations>
  </primitive>
  <primitive class="ocf" id="ip_204.109.13.7" provider="heartbeat" type="IPAddr2">
    <instance_attributes id="ip_204.109.13.7_ia">
      <nvpair id="ip_204.109.13.7_ip" name="ip" value="204.109.13.7"/>
      <nvpair id="ip_204.109.13.7_nm" name="cidr_netmask" value="32"/>
      <nvpair id="ip_204.109.13.7_nic" name="nic" value="eth70"/>
    </instance_attributes>
    <operations>
      <op id="ip_204.109.13.7_op_start" interval="0" name="start" timeout="30s"/>
      <op id="ip_204.109.13.7_op_stop" interval="0" name="stop" timeout="90s"/>
      <op id="ip_204.109.13.7_op_monitor" interval="61s" name="monitor" timeout="30s"/>
    </operations>
  </primitive>
</group>
```

PUPPETIZE!

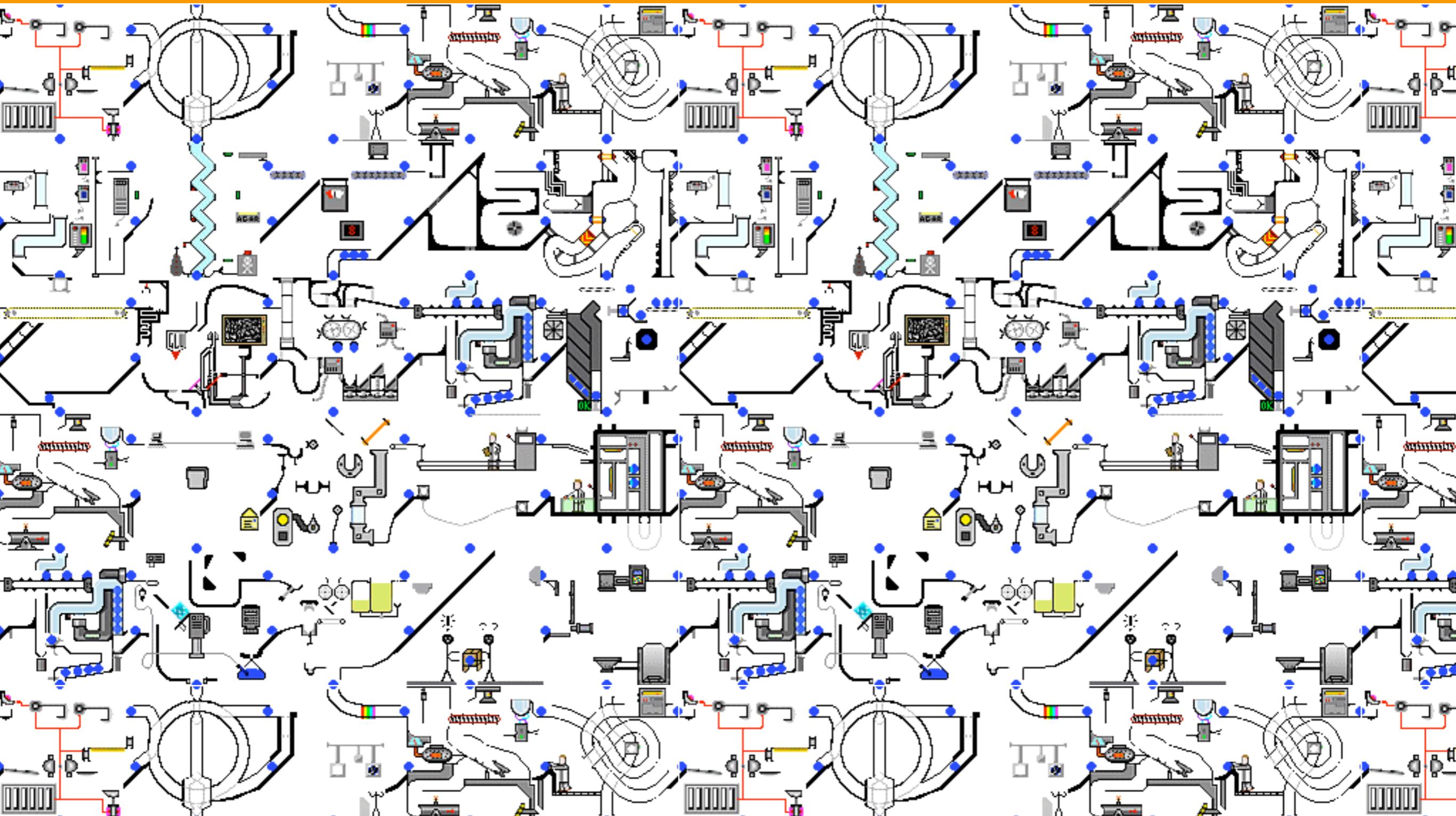


```
node "load1" {  
  
  pacemaker::ipvs_resource { "webapp":  
    description => "Braintree Webapp",  
    supervisor_id => "webapp",  
    ip_resources => [  
      { 'address' => '204.109.13.7', 'nic' => 'eth10' }  
    ]  
  }  
  
}
```





LOTS OF SIMPLE PIECES



TODAY

**WHAT WE VALUE
WHAT WE CHOOSE
WHAT WE BUILD**



WE HAVE
INTERESTING JOBS





H . A . IN YOUR DATACENTER

WHO NEEDS CLOUDS ?