A million containers isn't cool

You know what's cool?

A hundred containers

A million containers isn't cool

You know what's cool? A hundred containers.

@ChrisSinjo

GOCARDLESS


Google


Google
amazon


Google
amazon

We aren't #webscale

(#sorrynotsorry)

So why do we care about containers?

```
POST /cash/monies HTTP/1.1

{ amount: 100 }
```

High  per-request

Reliability is 🔑

Deploying software reliably

Deploying software reliably

How containers can help

Deploying software reliably

How containers can help

Other options

First things first: deployment artifacts

Source code

↓

Something you can put on a server

A .jar file

A statically linked binary

An OS package (.deb, .rpm)

Some languages start on the back foot

Capistrano:
a typical Ruby flow

On each server:

On each server:

- Clone source

On each server:

- Clone source
- Build dependencies

On each server:

- Clone source
- Build dependencies
- Run schema migrations

On each server:

- Clone source
- Build dependencies
- Run schema migrations
- Build static assets

On each server:

- Clone source
- Build dependencies
- Run schema migrations
- Build static assets
- SIGHUP

What's wrong here?

Hope

On each server:

- Clone source
- Build dependencies
- Run schema migrations
- Build static assets
- SIGHUP

On each server:

- Clone source
- Build dependencies
- Run schema migrations
- Build static assets
- SIGHUP

```
$ bundle install
…
Building nokogiri using system libraries.

Gem::Ext::BuildError: ERROR: Failed to build
gem native extension.
```

On each server:

- Clone source
- Build dependencies
- Run schema migrations
- Build static assets
- SIGHUP

On each server:

- Clone source
- Build dependencies
- Run schema migrations
- Build static assets
- SIGHUP

Hope

Hope

On each server:

- Clone source
- Build dependencies
- Run schema migrations
- Build static assets
- SIGHUP

Hope

Hope

Hope

“Hope is not a strategy.”

– Traditional SRE saying

https://landing.google.com/sre/book.html

There´s something else

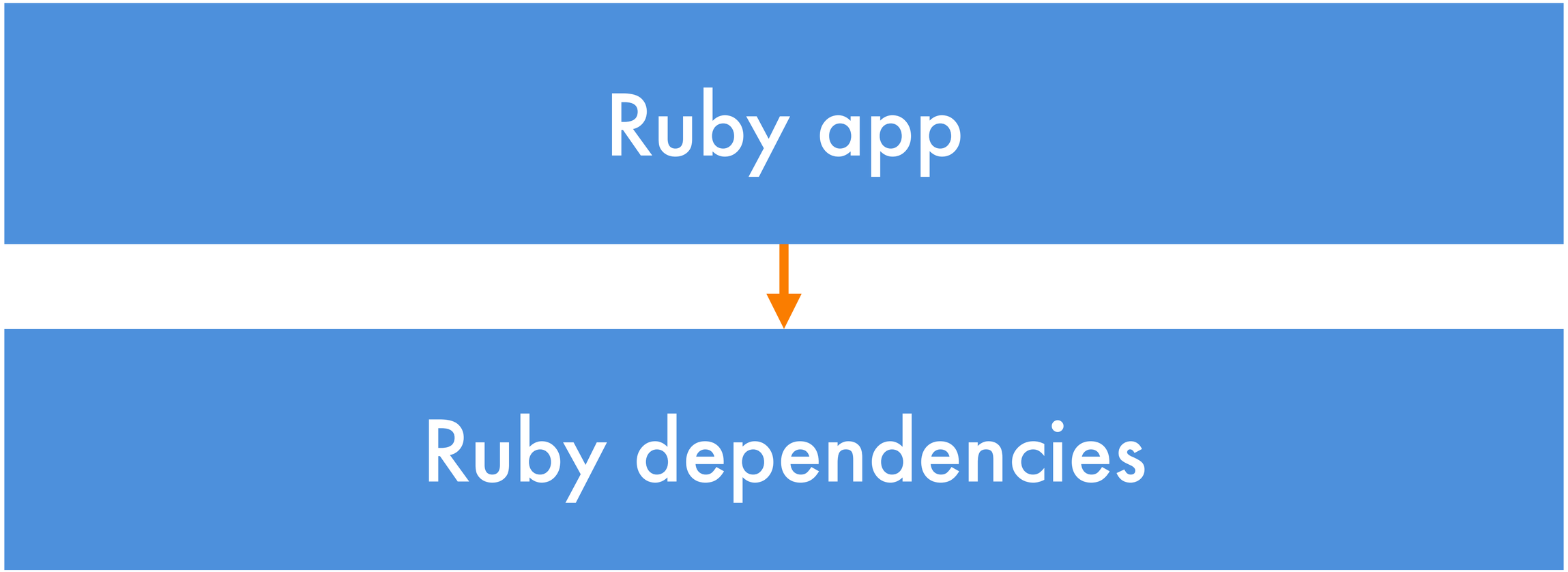
Applications

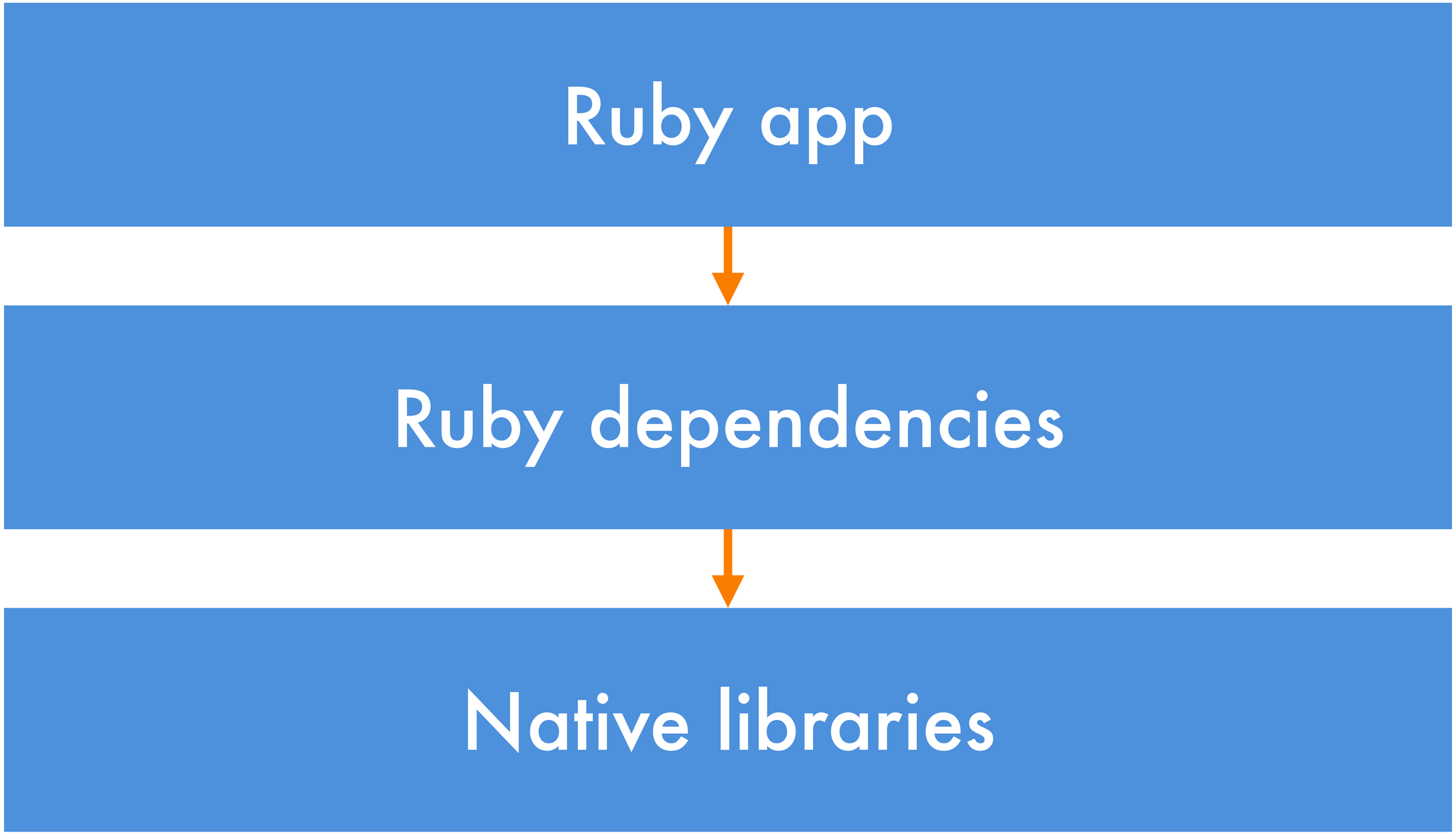
don't

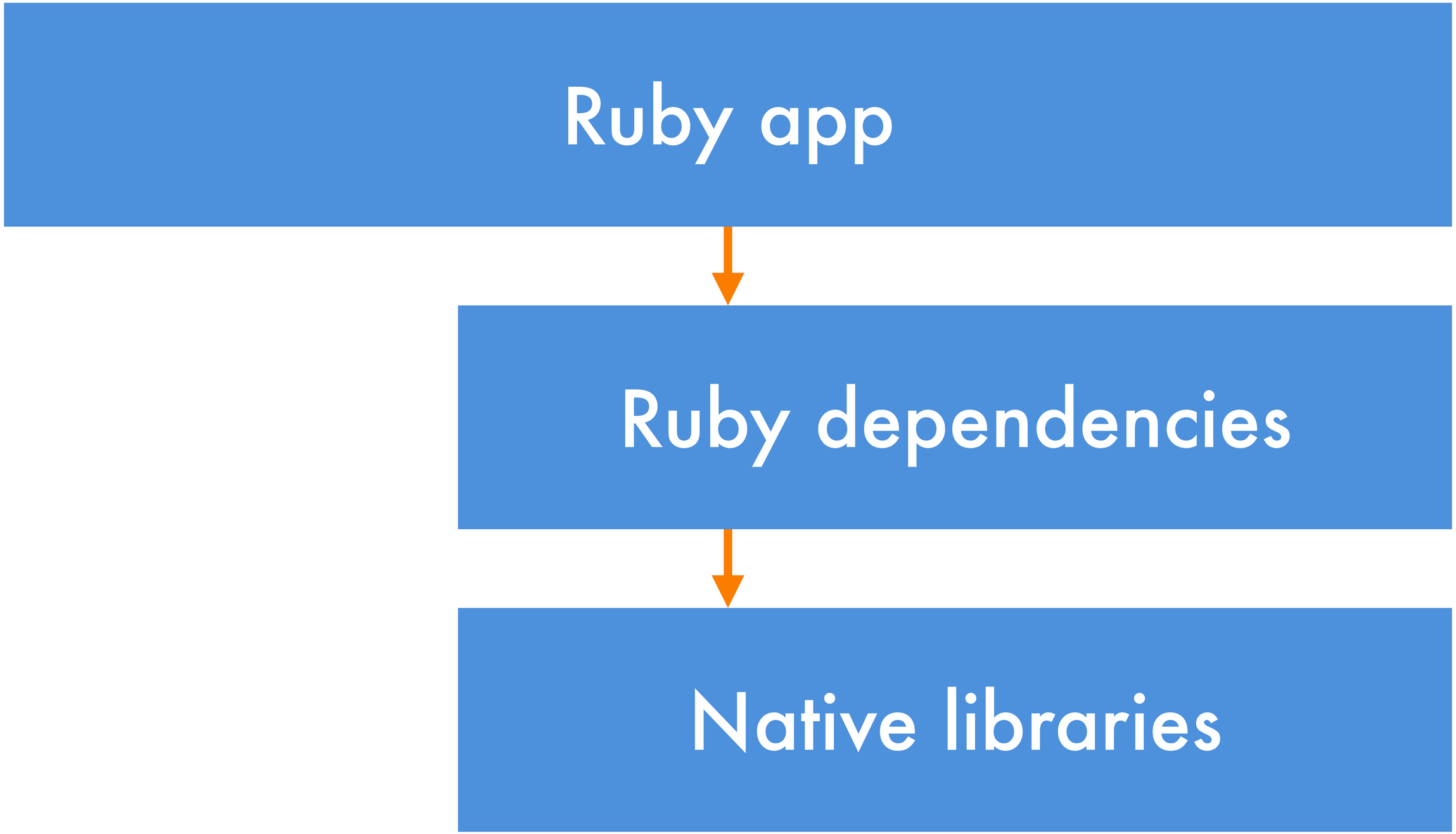
run in a

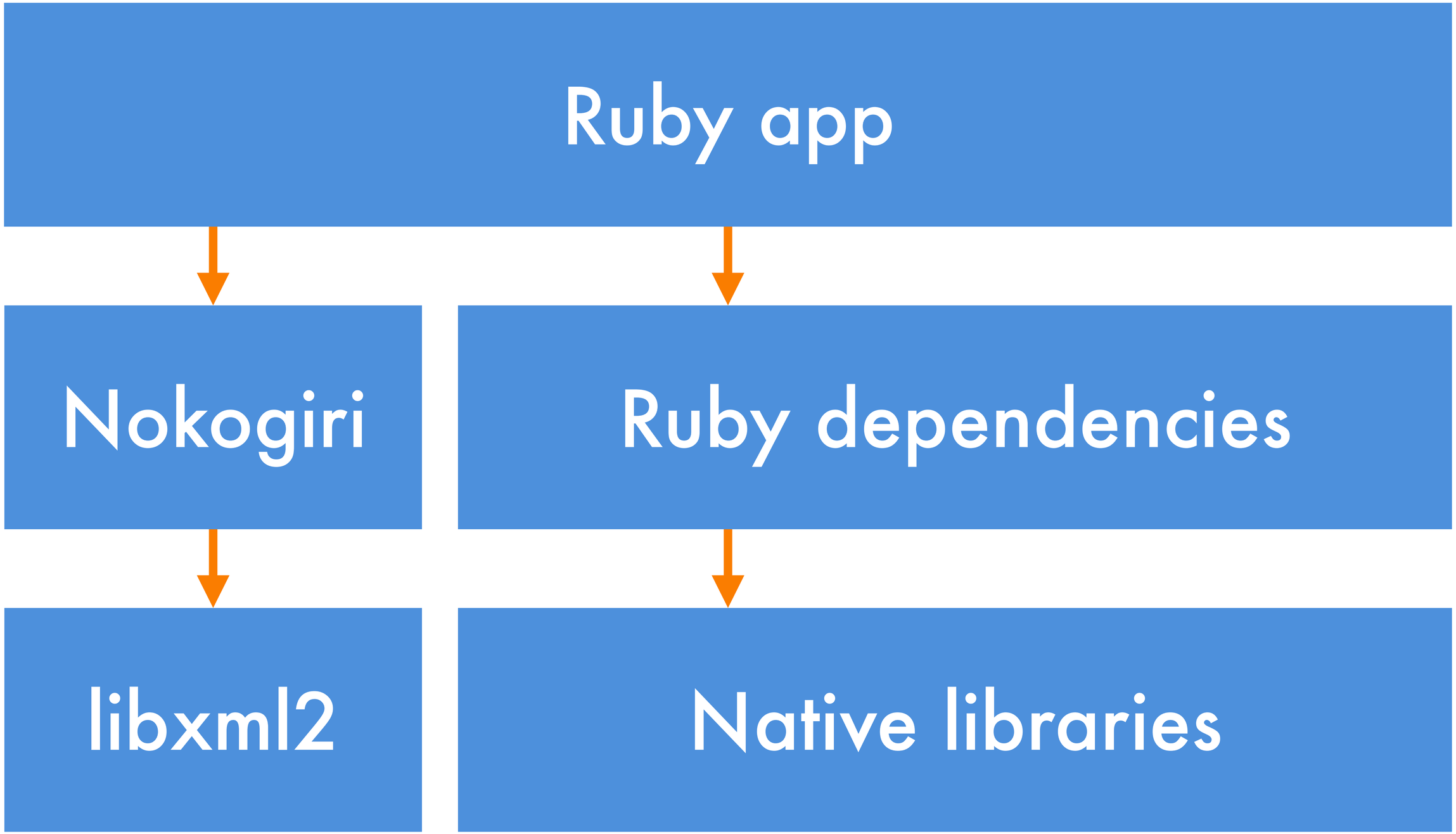
vacuum

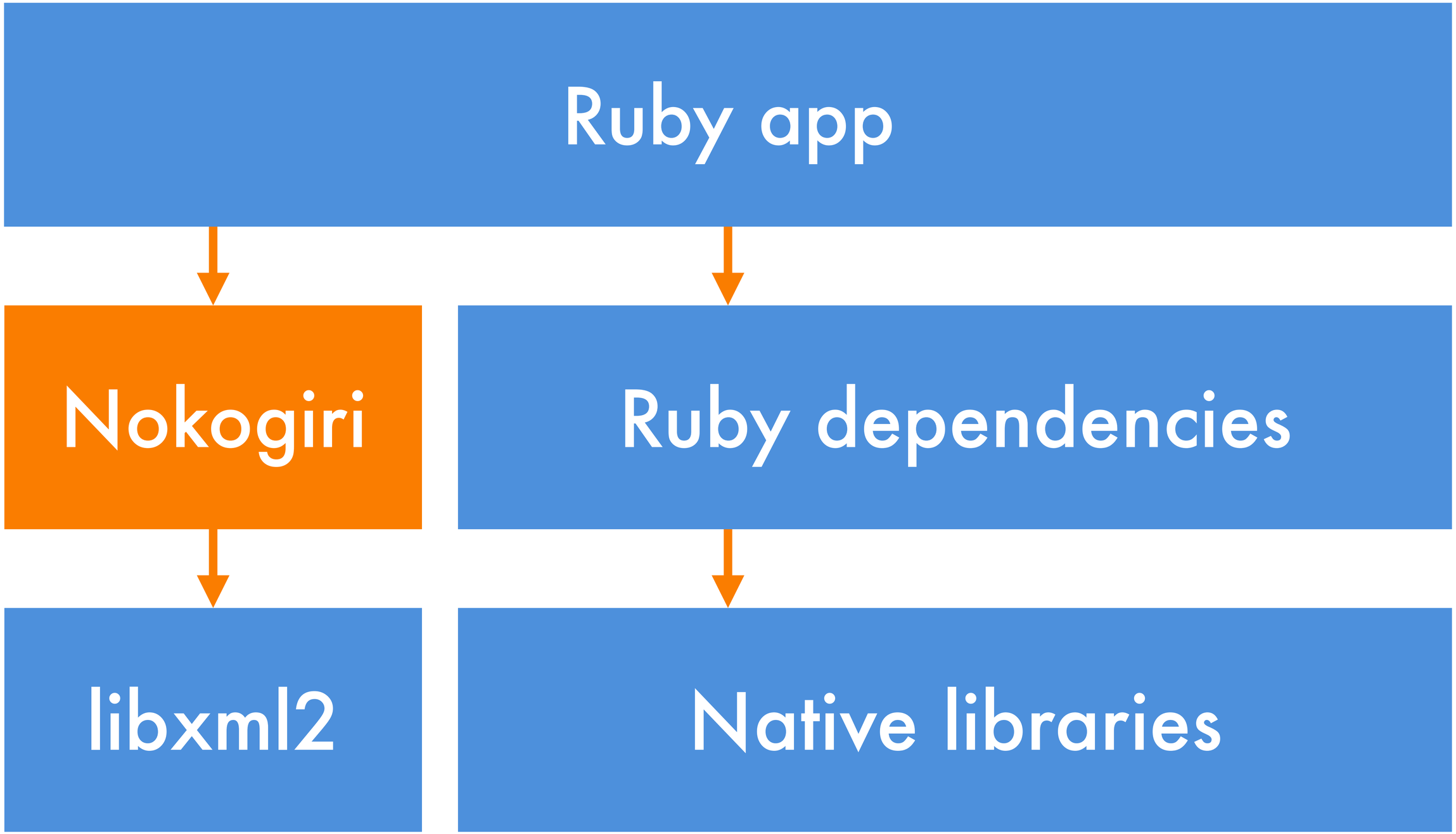
Ruby app

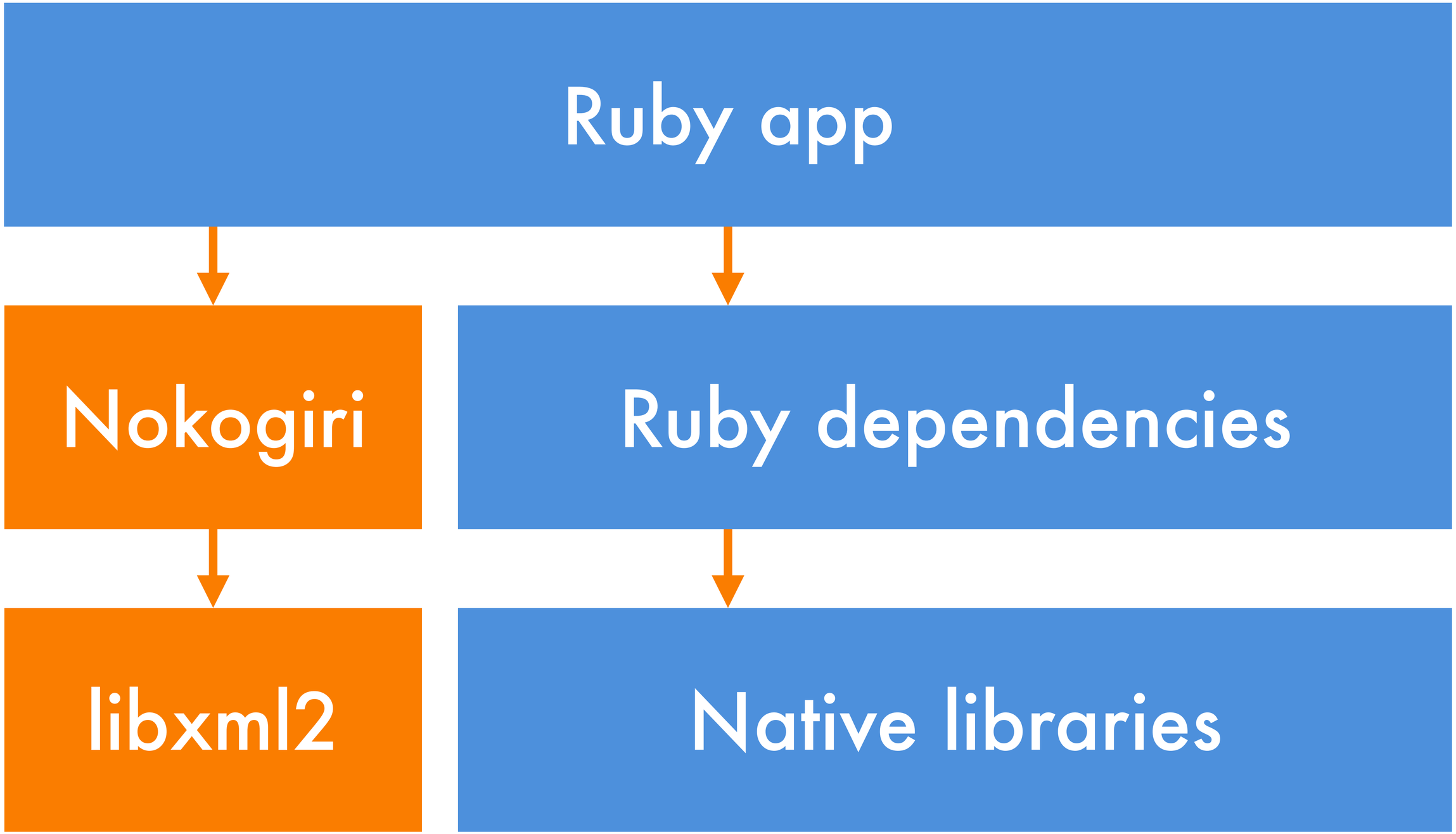

Ruby app
Ruby dependencies


Ruby app
Ruby dependencies
Native libraries

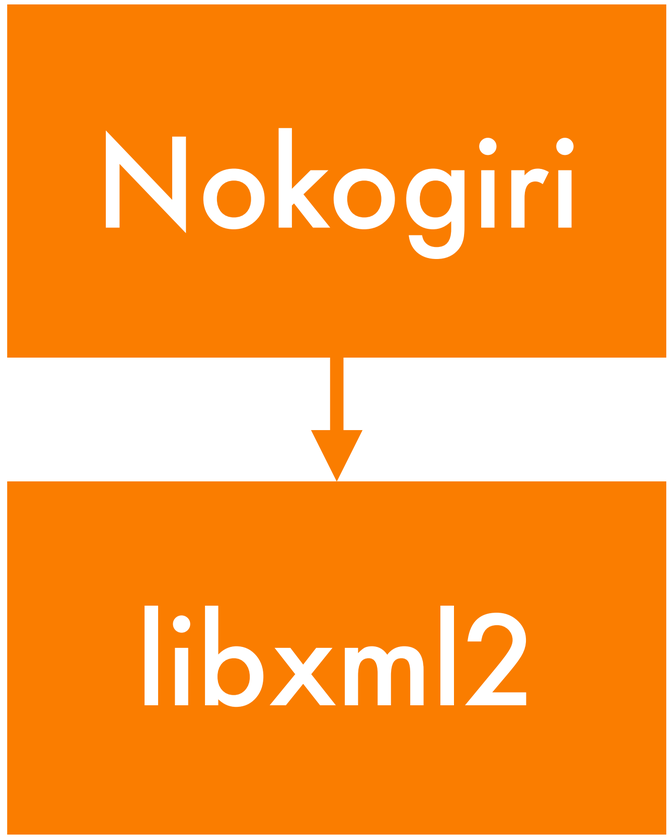

Ruby app
Ruby dependencies
Native libraries

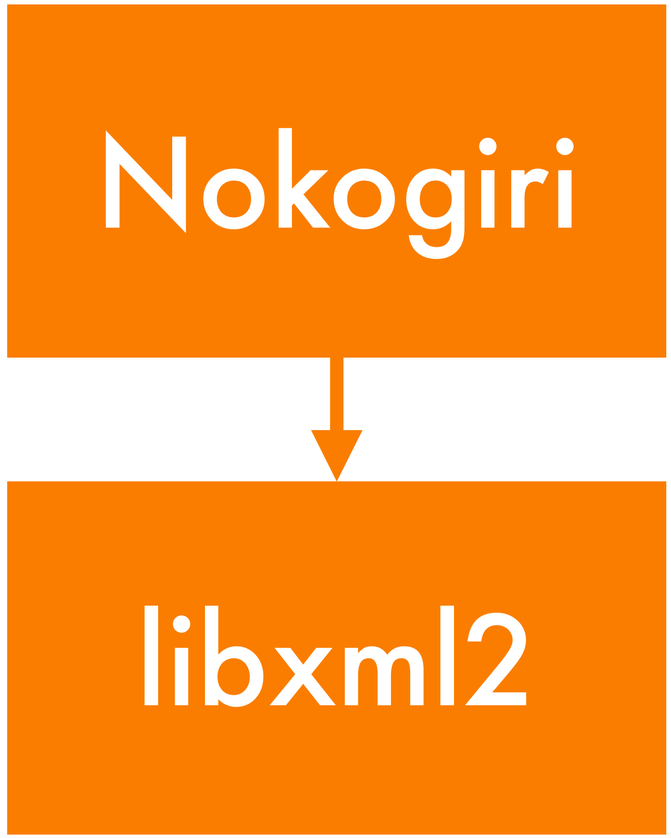

Ruby app
Nokogiri
Ruby dependencies
libxml2
Native libraries


Ruby app
Nokogiri
Ruby dependencies
libxml2
Native libraries

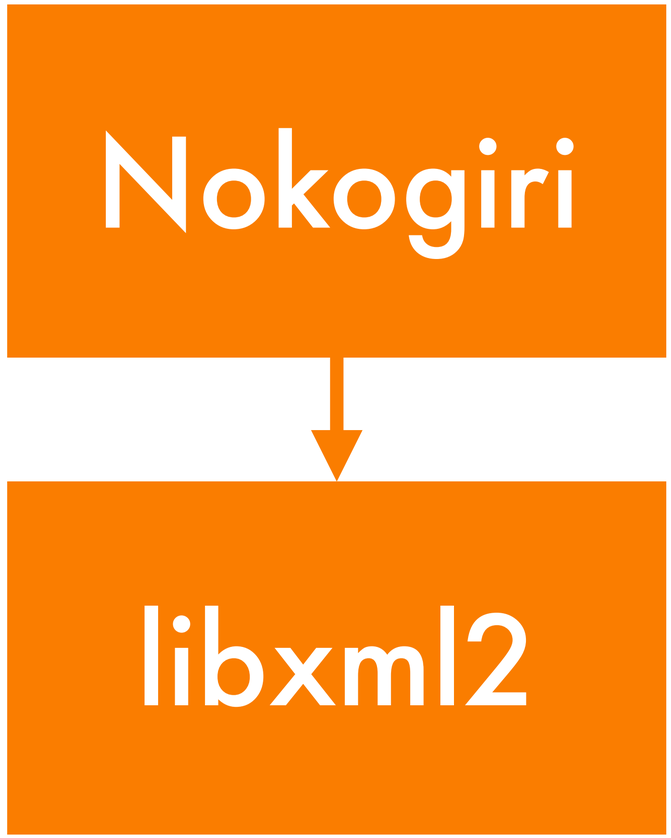

Ruby app
Nokogiri
Ruby dependencies
libxml2
Native libraries

How do we install software?


Nokogiri
libxml2

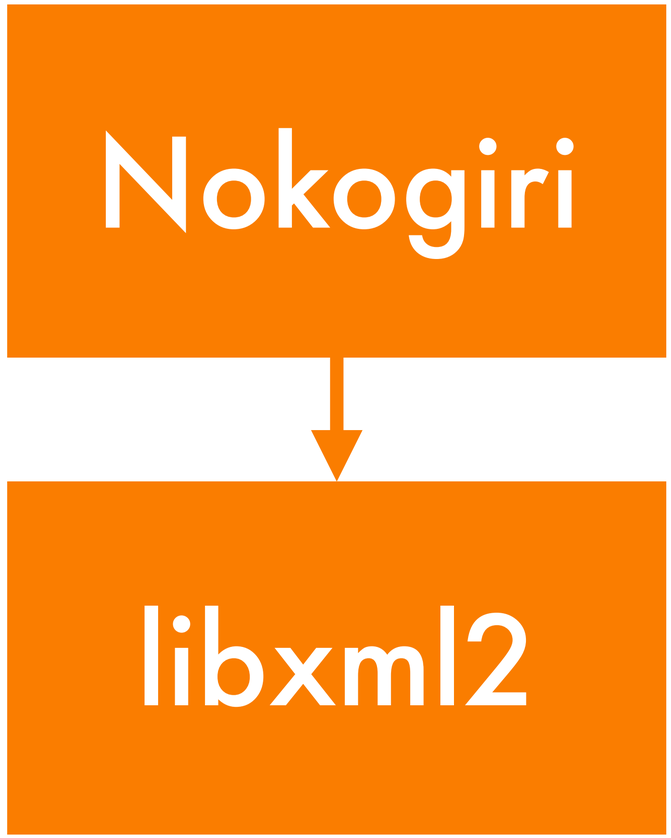



```
$ bundle install
```




```
$ bundle install
```

```
$ apt-get install libxml2
```

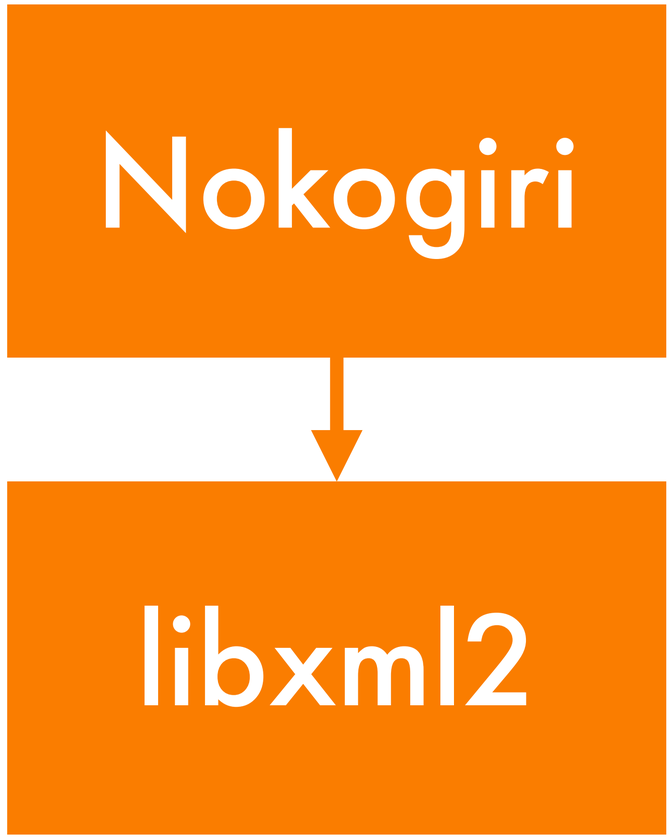


App's source repository

Chef or whatever

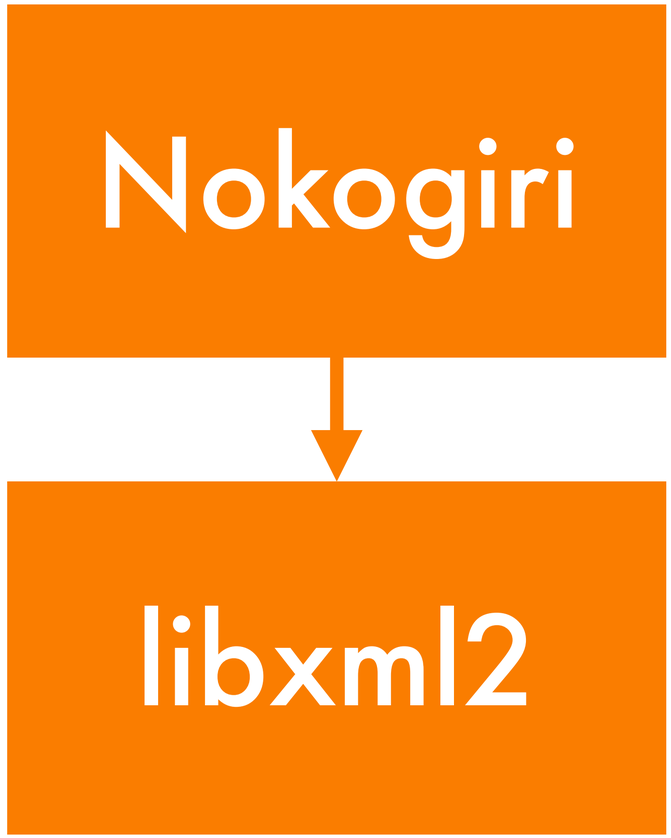
That seems inconvenient...

Container images:
totally a thing



App's source repository

Chef or whatever



App's source repository

App's source repository

This is why most people care about Docker

namespaces

cgroups

images

~~namespaces~~

~~cgroups~~

images

Benji Weber
@benjiweber

Following

OH: @ChrisSinjo "Docker is a fat-jar for people not on the JVM"

RETWEETS **7**

LIKES **11**

6:06 PM - 29 Aug 2016

https://twitter.com/benjiweber/status/770306615555854336

Deploying software reliably

How containers can help

Other options

Deploying software reliably

How containers can help

Other options

So what did we care about?

Uniform deployment

Uniform deployment

Based around an artifact

Uniform deployment

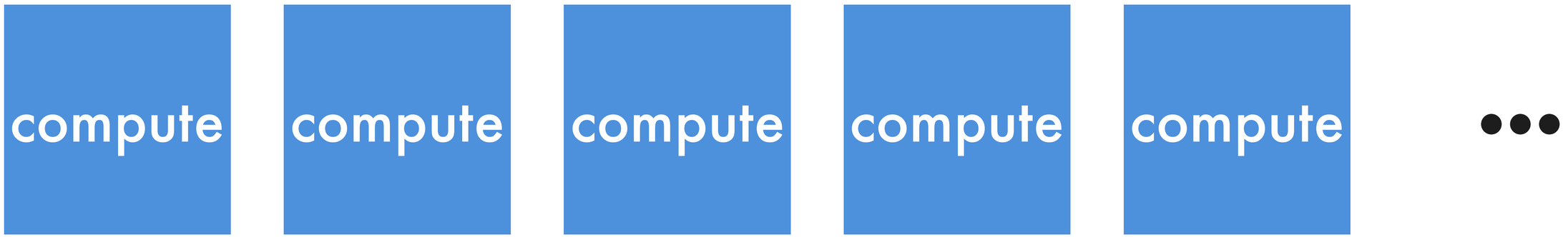
Based around an artifact

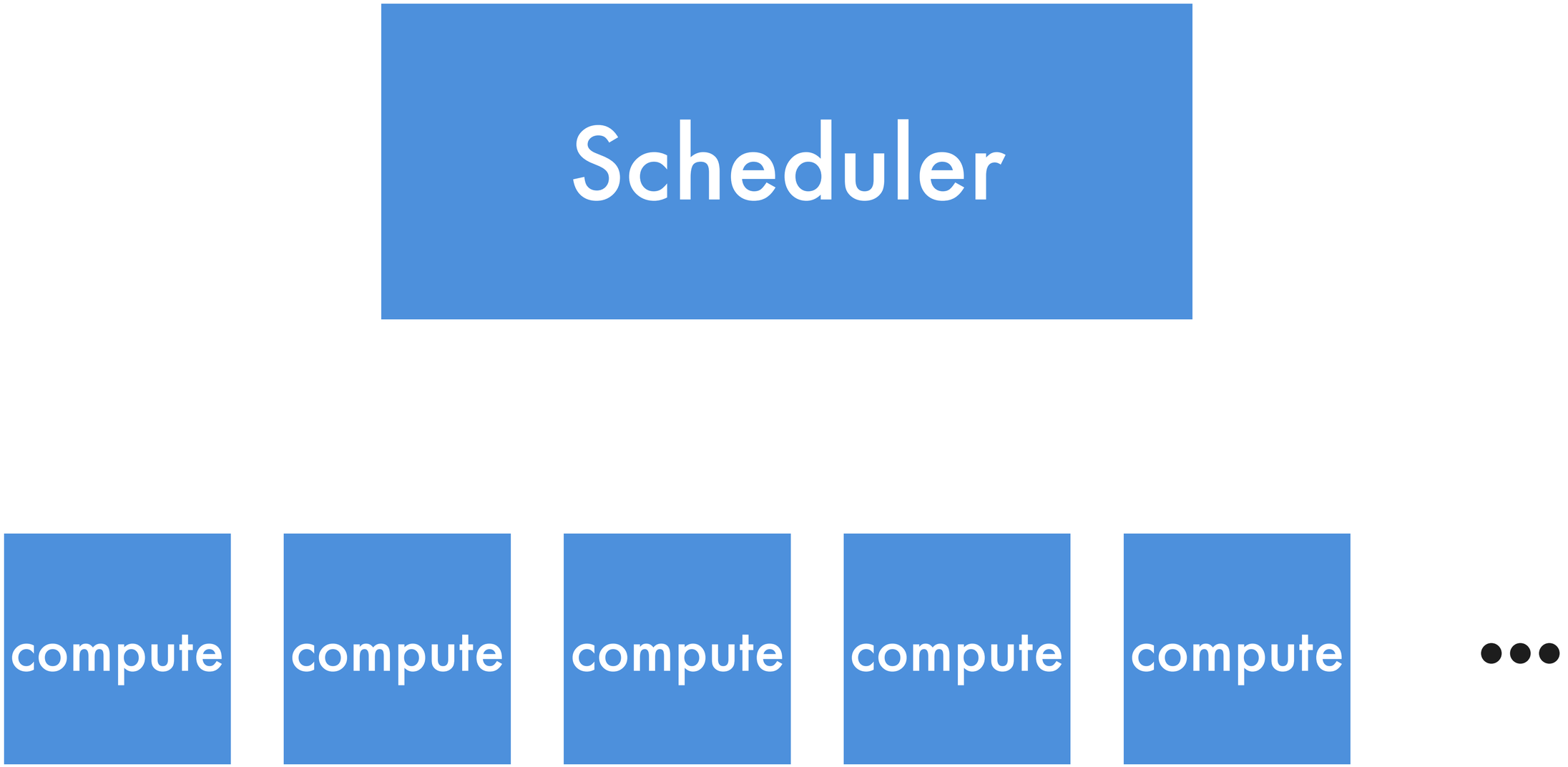
Fail early

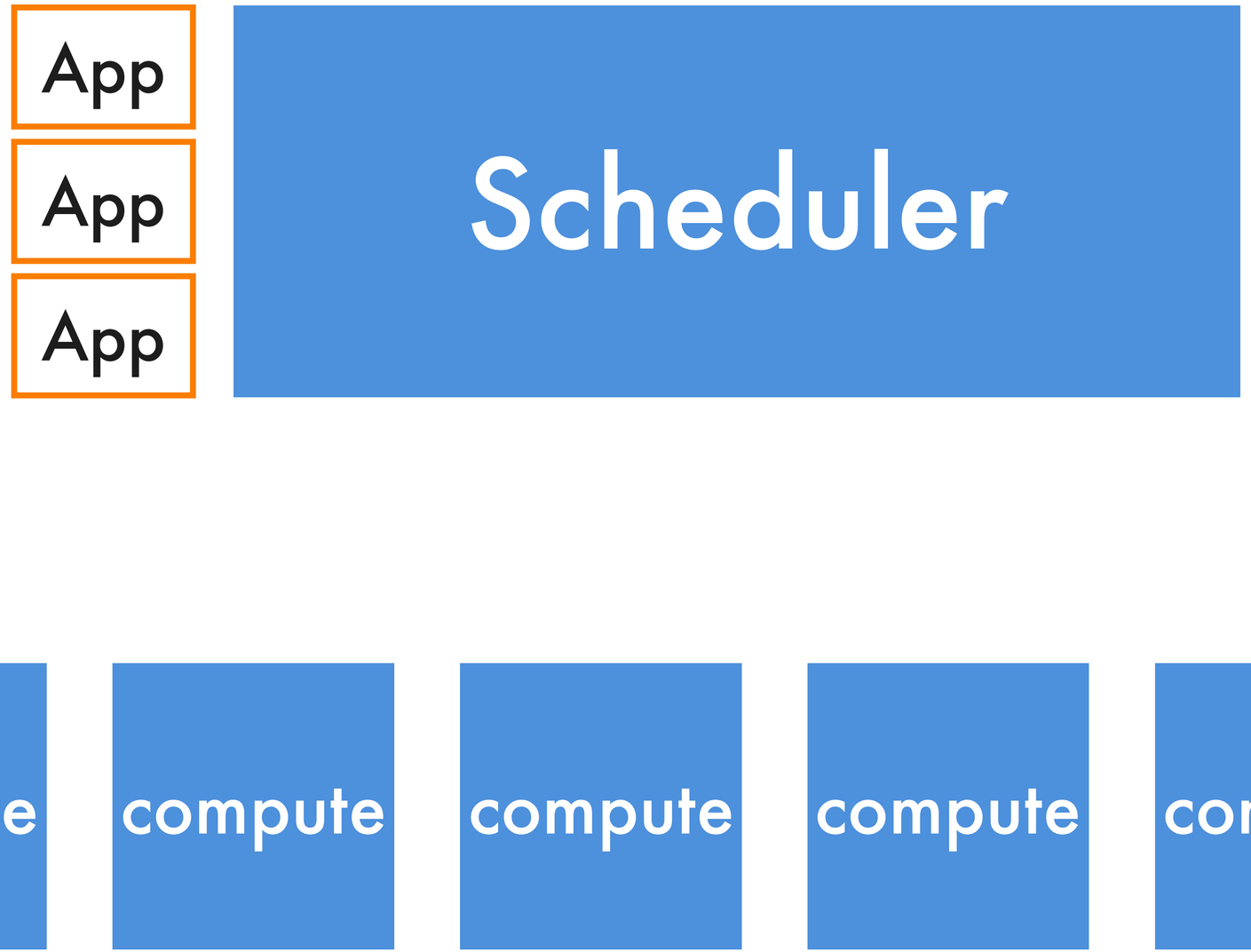
And what didn't we care about?

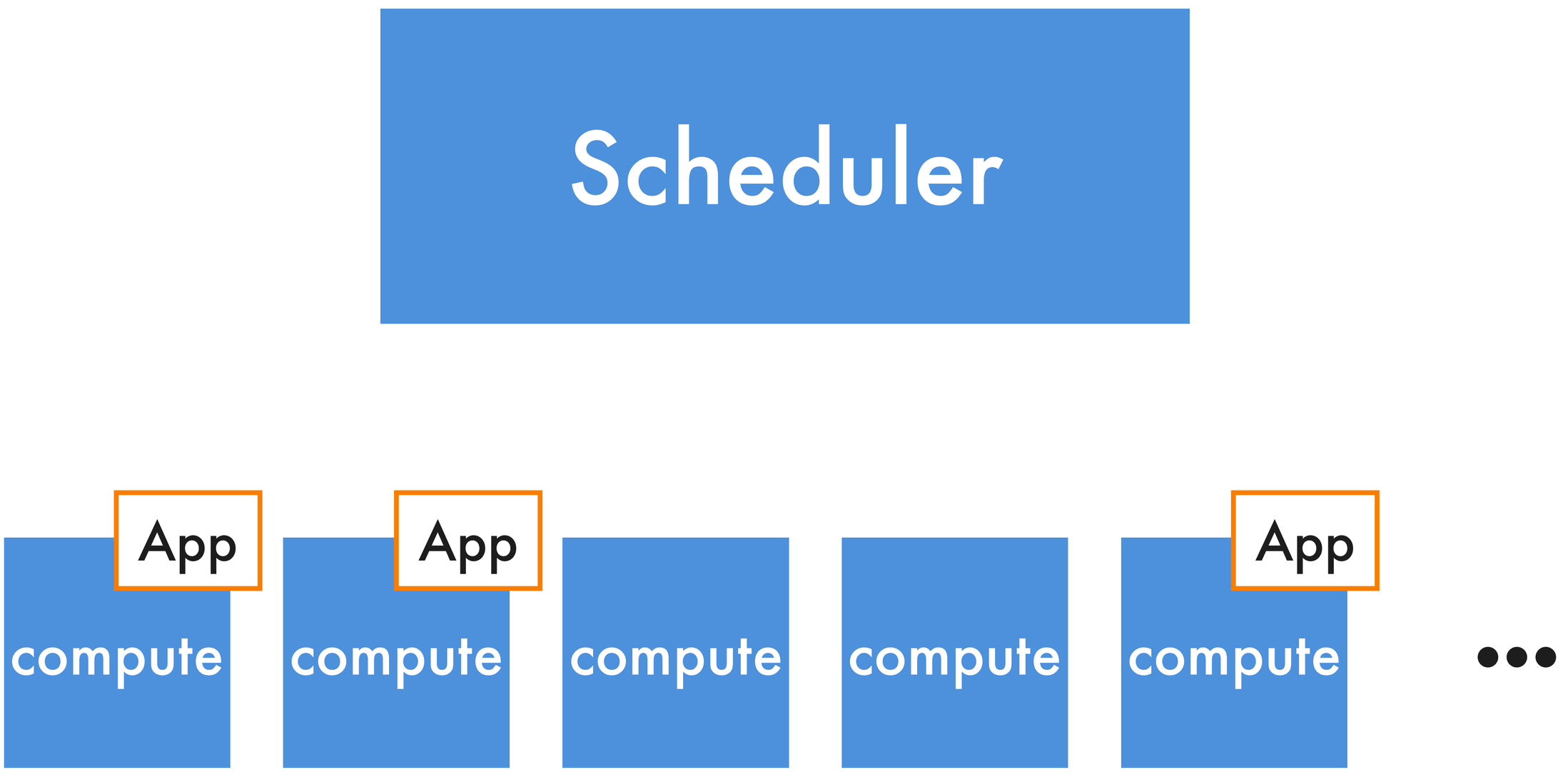
Know what your aims aren't

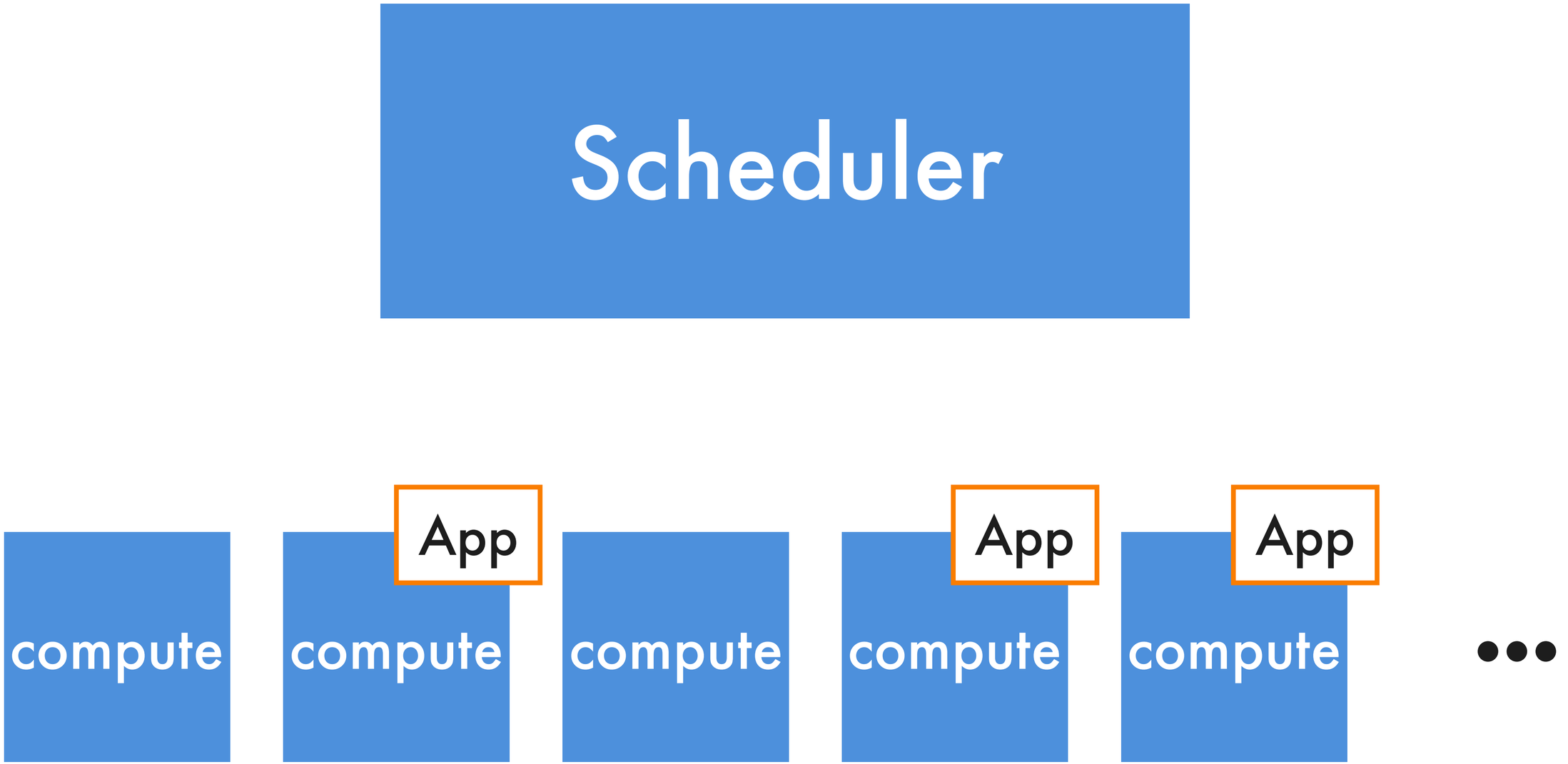
Distributed schedulers


compute
compute
compute
compute
compute


Scheduler
compute
compute
compute
compute
compute


App
App
App
Scheduler
compute
compute
compute
compute
compute
...


Scheduler
App
App
App
compute
compute
compute
compute
compute
•••


Scheduler
compute
App
compute
compute
App
compute
App
compute
•••

Nothing comes for free

Kubernetes means:

Kubernetes means:

– a distributed scheduler

Kubernetes means:

- a distributed scheduler
- cluster DNS

Kubernetes means:

- a distributed scheduler
- cluster DNS
- etcd

Kubernetes means:

- a distributed scheduler
- cluster DNS
- etcd
- …

Nothing comes for free

We aren't #webscale

(#sorrynotsorry)

Distributed schedulers

~~Distributed~~

~~schedulers~~

So what did we build?

3 parts...

Service definitions

A service:

A service:

– an image

A service:

- an image
- environment config

A service:

- an image
- environment config
- command to run

A service:

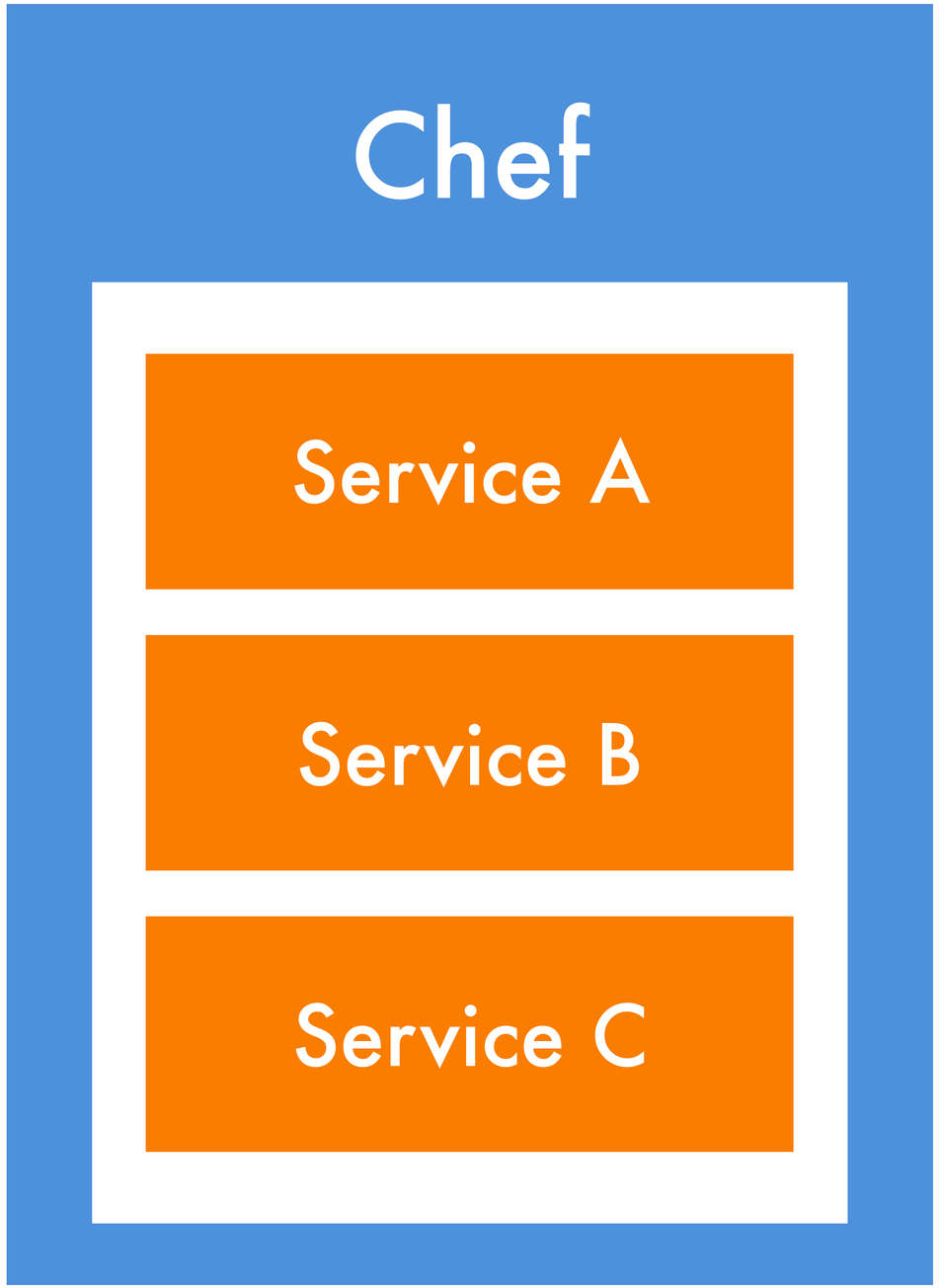
- an image
- environment config
- command to run
- limits (memory, CPU)

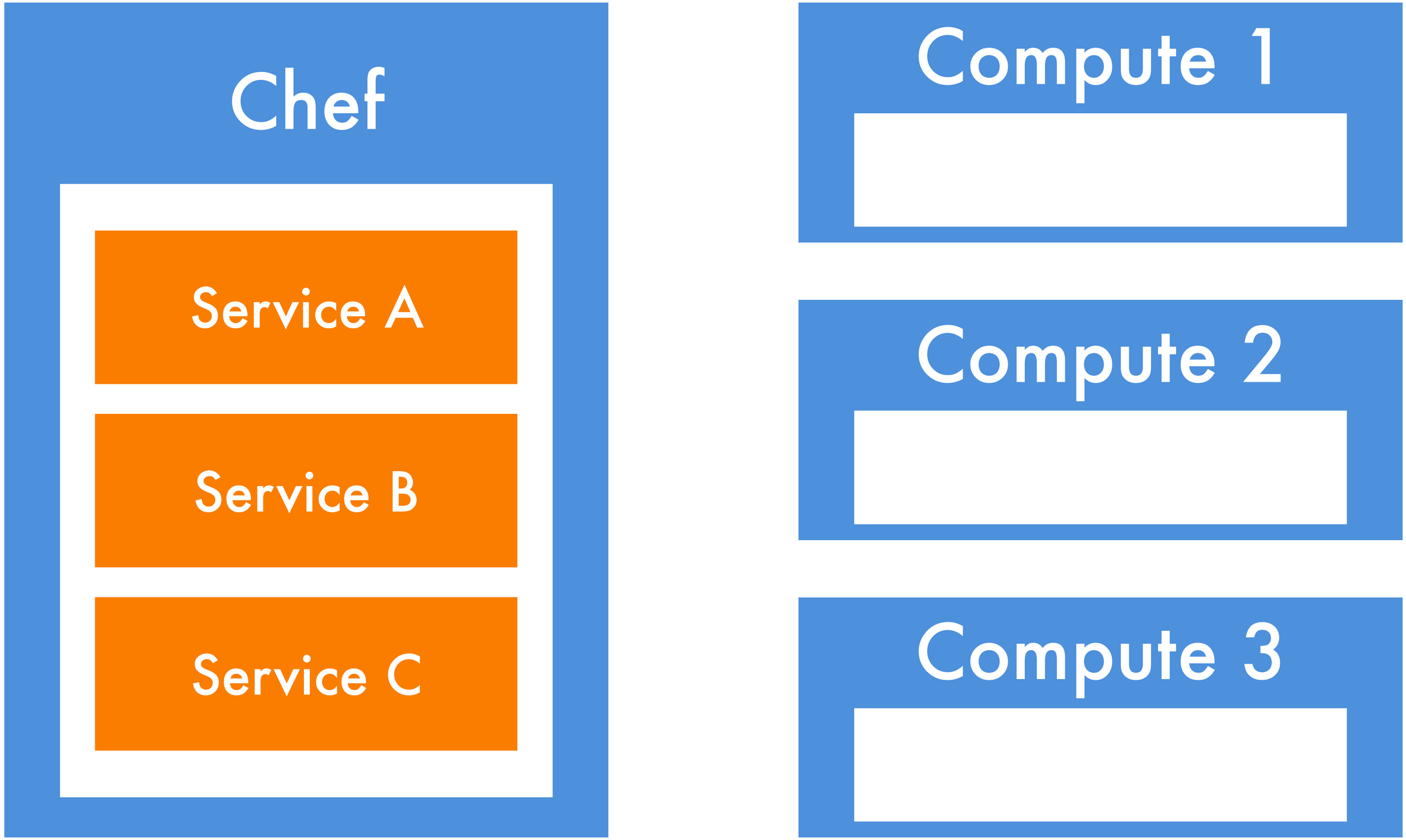
A service:

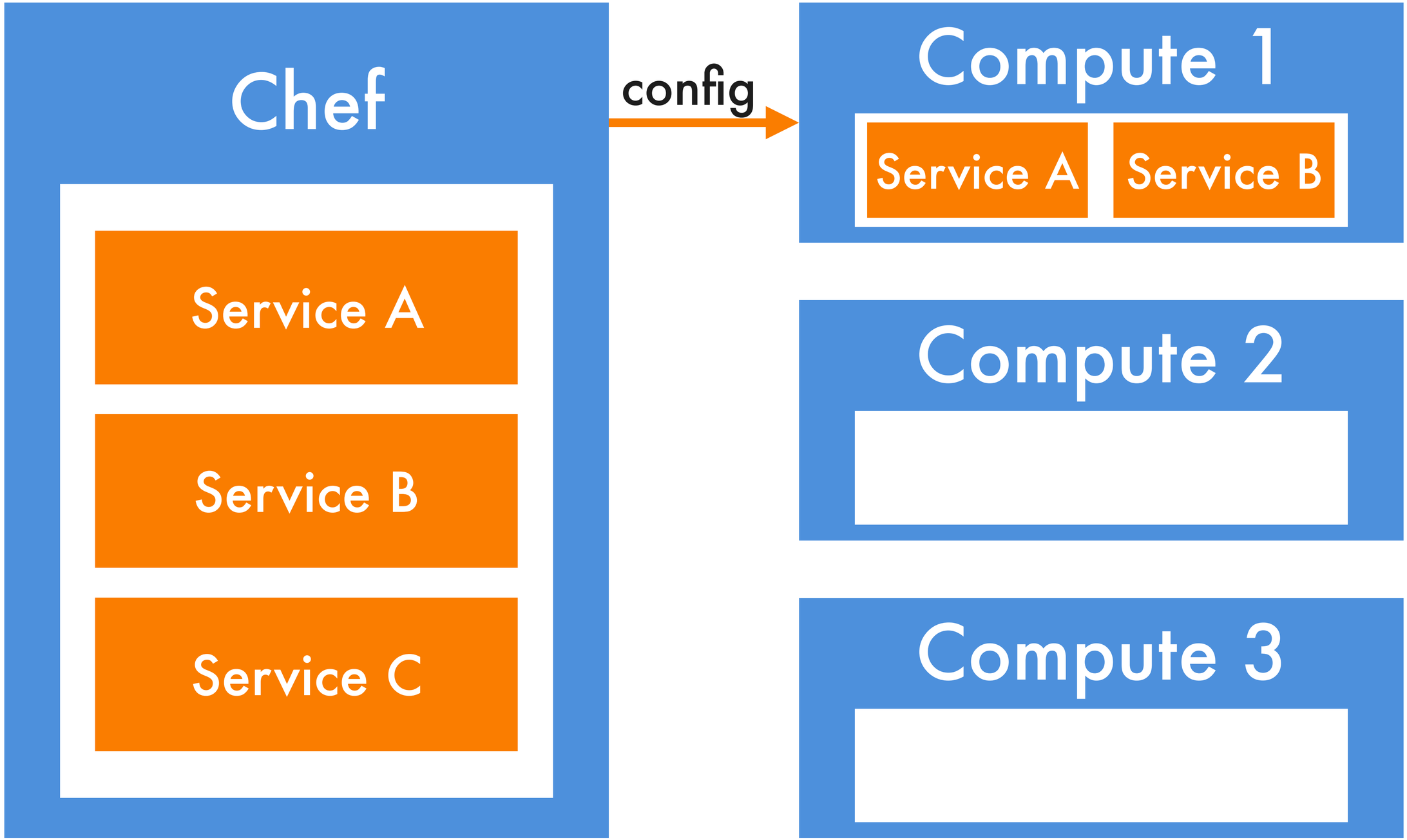
- an image
- environment config
- command to run
- limits (memory, CPU)
- ...

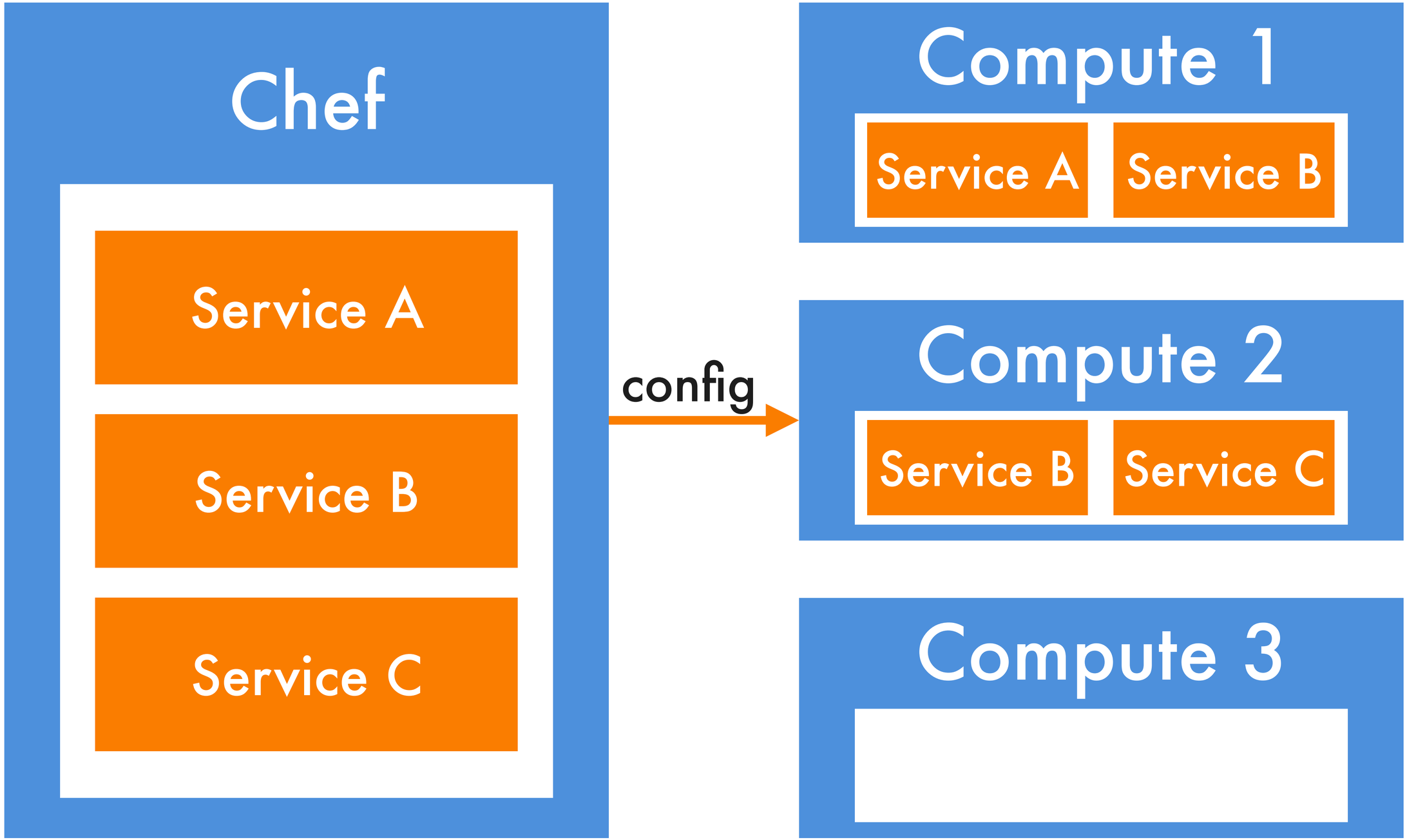
This is
config management

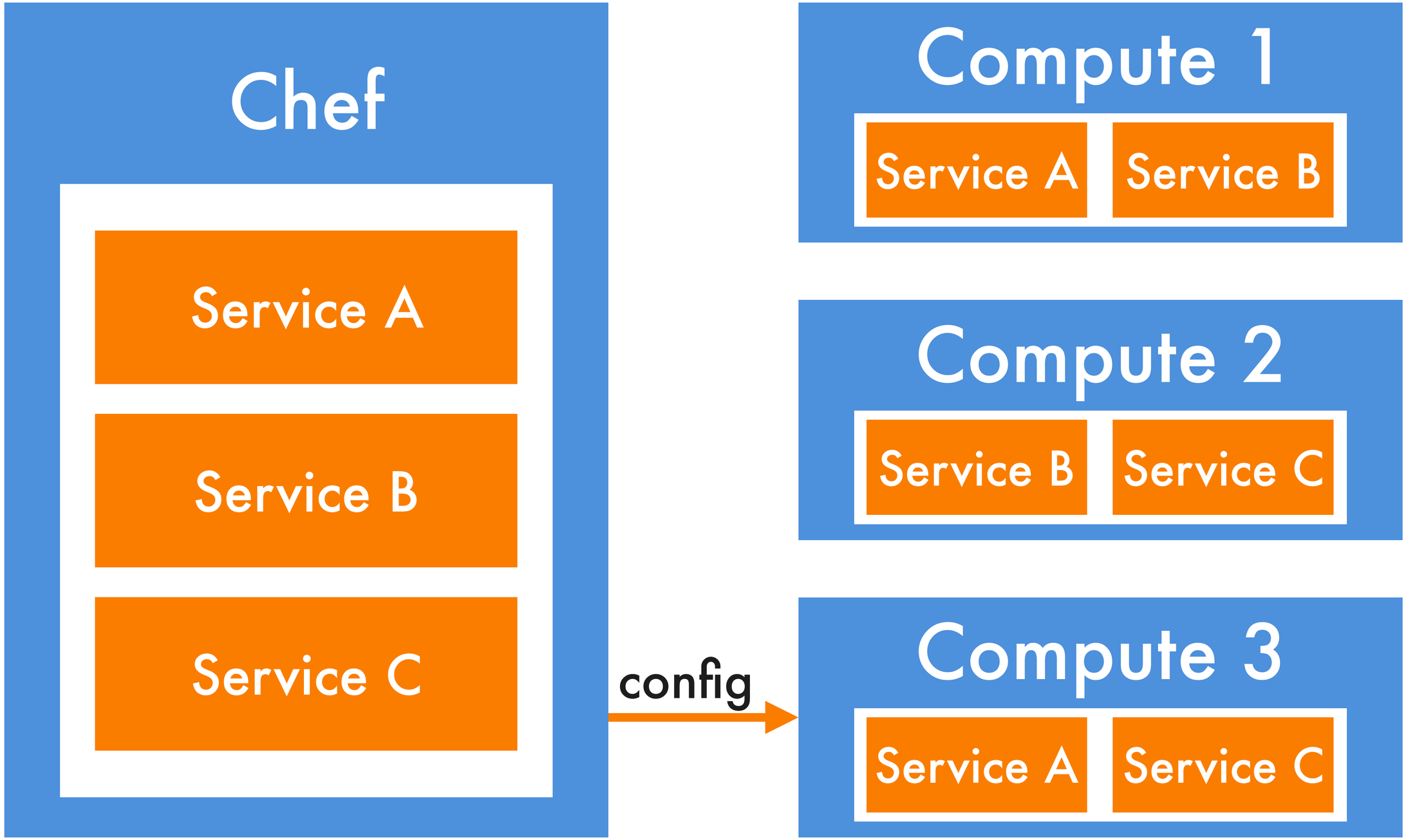
So we used Chef

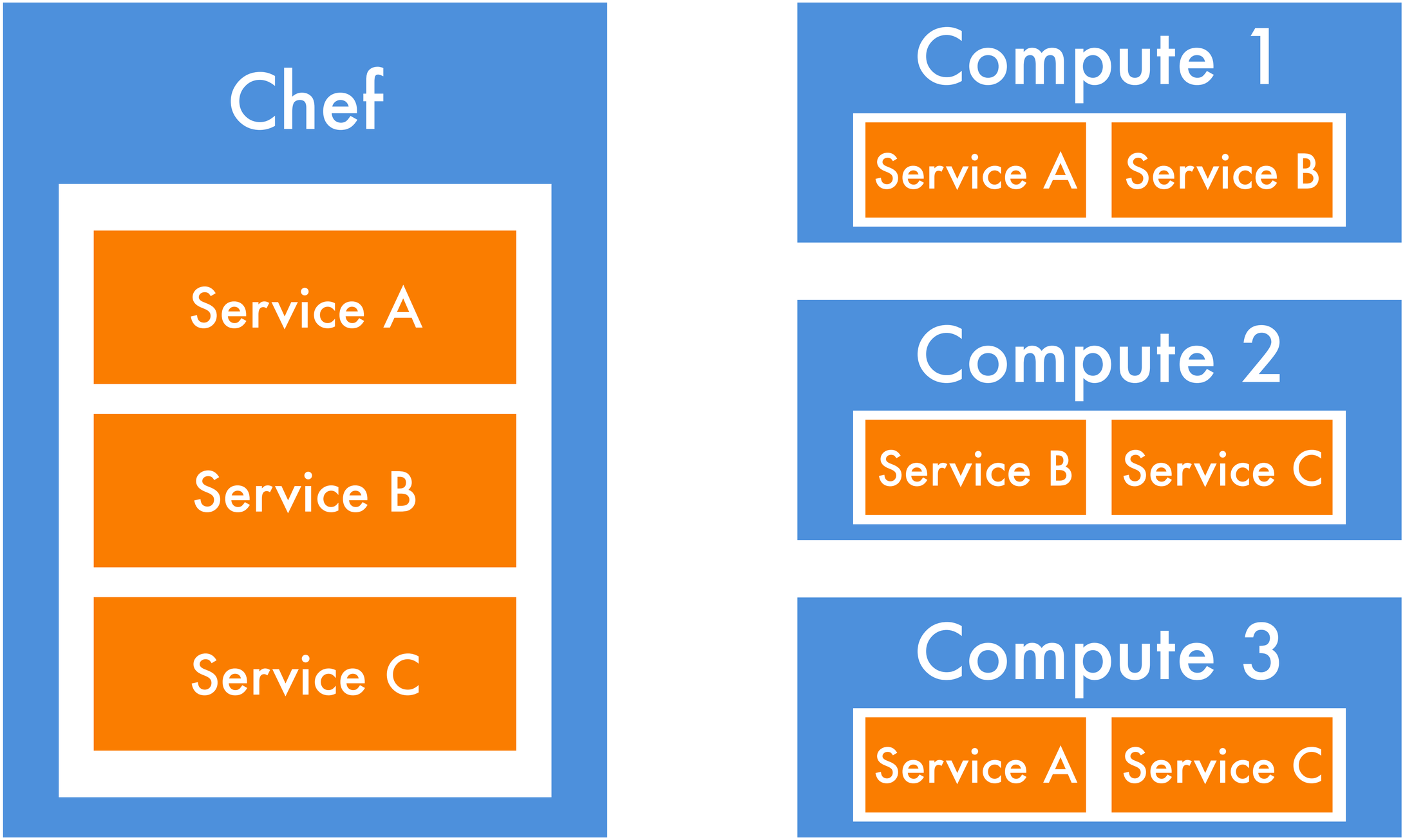

Chef
Service A
Service B
Service C


Chef
Service A
Service B
Service C
Compute 1
Compute 2
Compute 3


Chef
Service A
Service B
Service C
config
Compute 1
Service A
Service B
Compute 2
Compute 3


Chef
Service A
Service B
Service C
config
Compute 1
Service A
Service B
Compute 2
Service B
Service C
Compute 3


Chef
Service A
Service B
Service C
config
Compute 1
Service A
Service B
Compute 2
Service B
Service C
Compute 3
Service A
Service C


Chef
Service A
Service B
Service C
Compute 1
Service A
Service B
Compute 2
Service B
Service C
Compute 3
Service A
Service C

Service definitions

Service definitions

Single-node orchestration

Enter Conductor

```
conductor service upgrade
  --id gocardless_app_production
  --revision 279d903588
```

```
conductor service upgrade
  --id gocardless_app_production
  --revision 279d903588
```

```
conductor service upgrade
  --id gocardless_app_production
  --revision 279d903588
```

The flow:

The flow:

– start containers for new version

The flow:

– start containers for new version

– wait for health check

The flow:

- start containers for new version
- wait for health check
- rewrite local nginx config

The flow:

- start containers for new version
- wait for health check
- rewrite local nginx config
- reload nginx

The flow:

- start containers for new version
- wait for health check
- rewrite local nginx config
- reload nginx
- stop old containers

Conductor

nginx

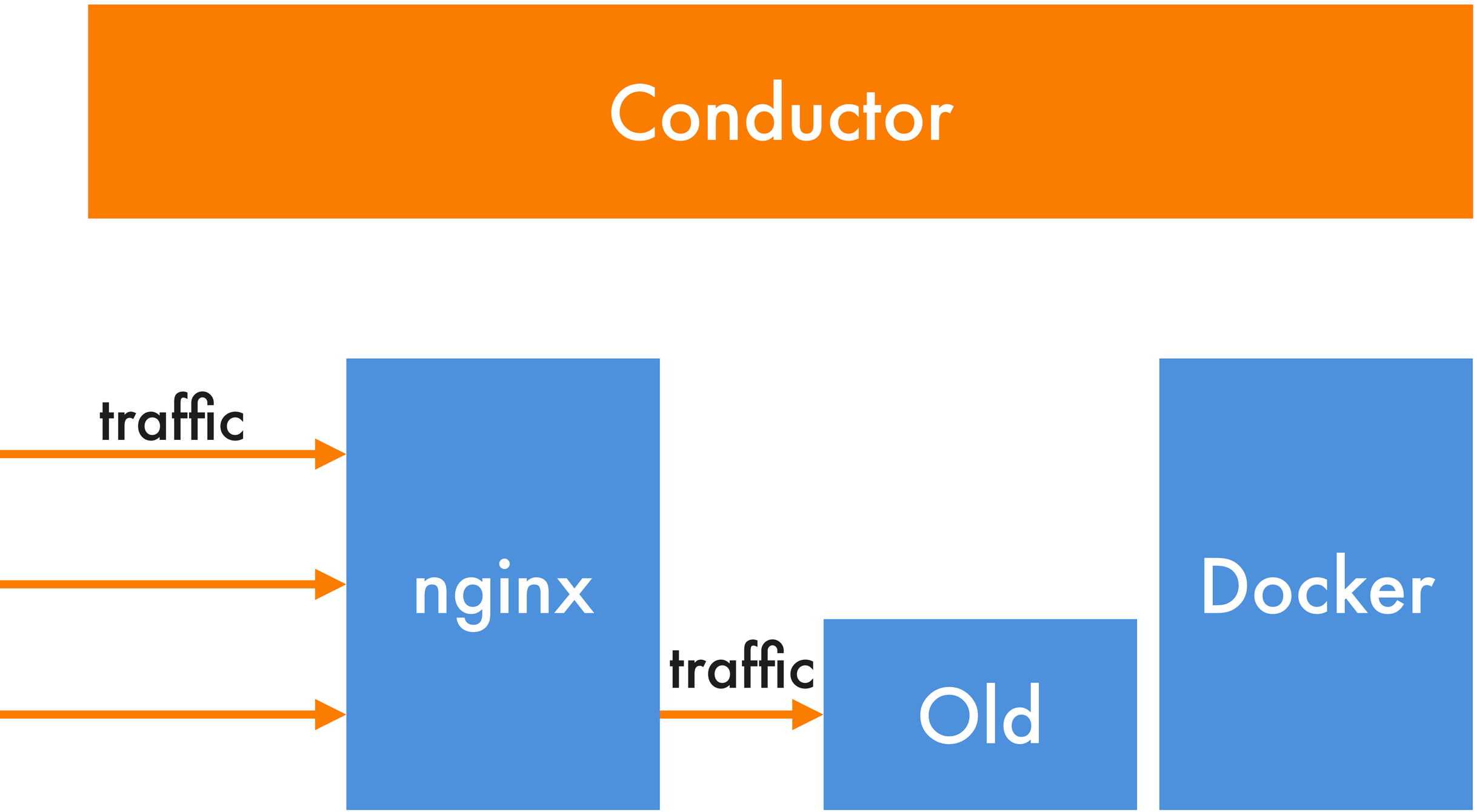
Docker

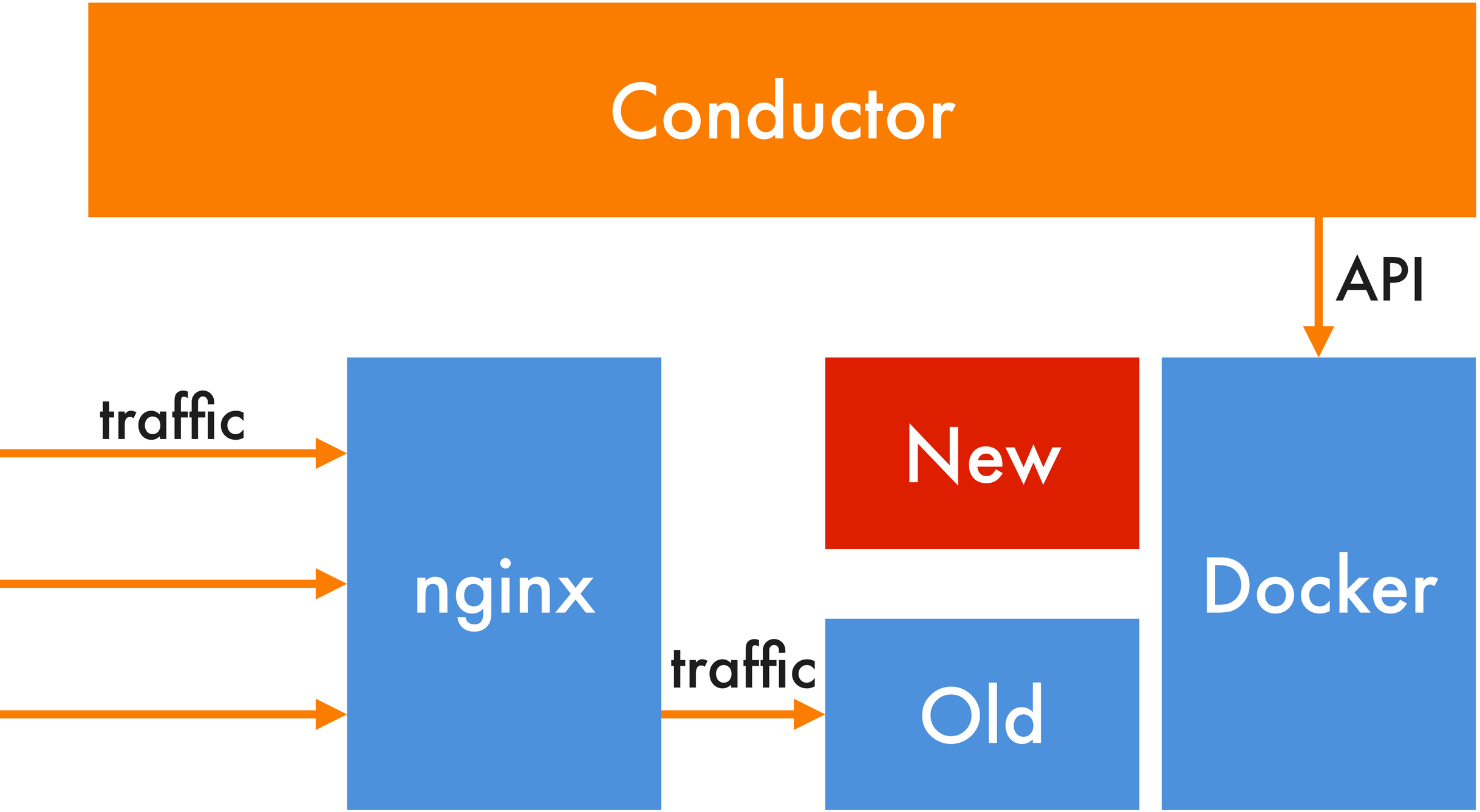
Conductor

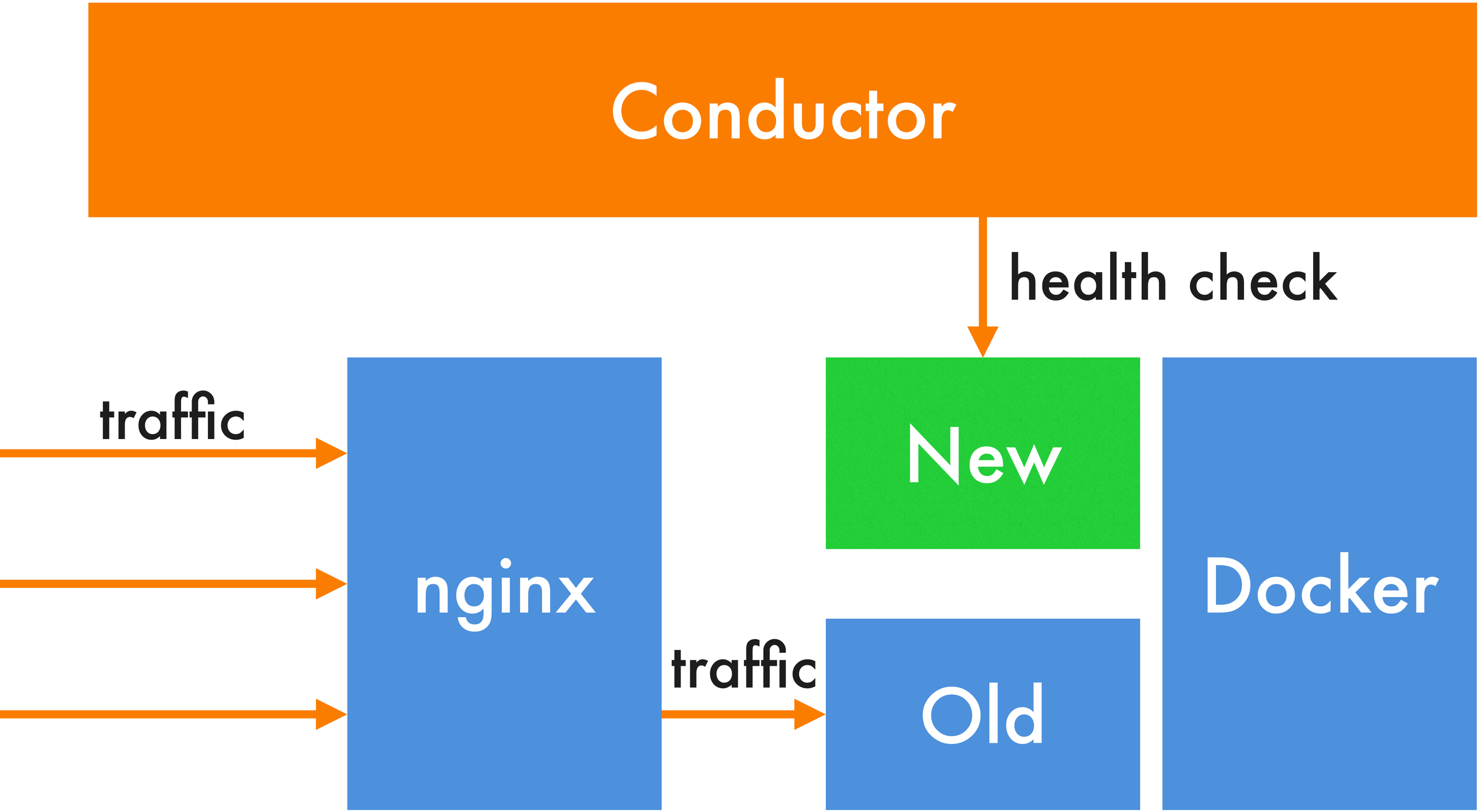
nginx

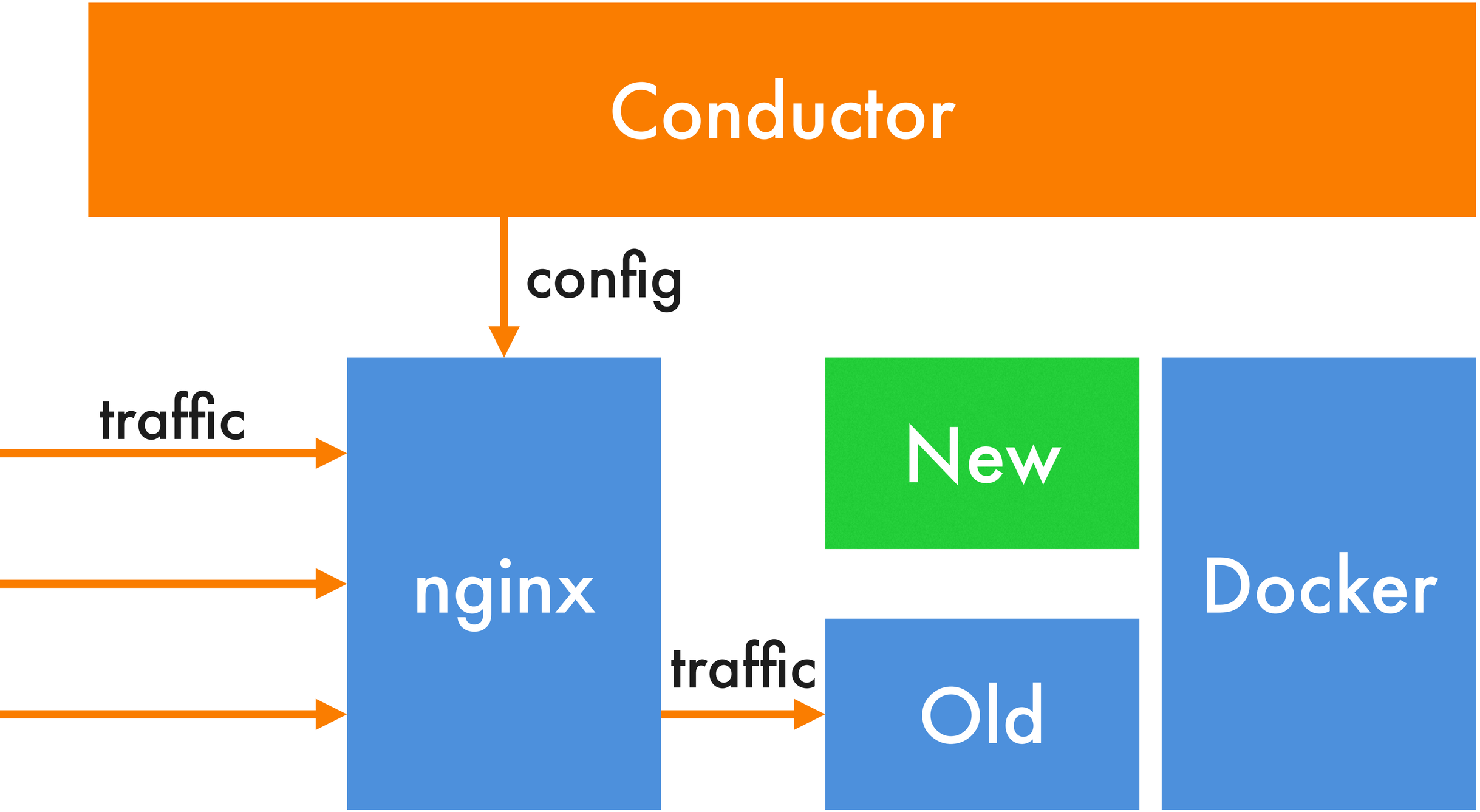
Old

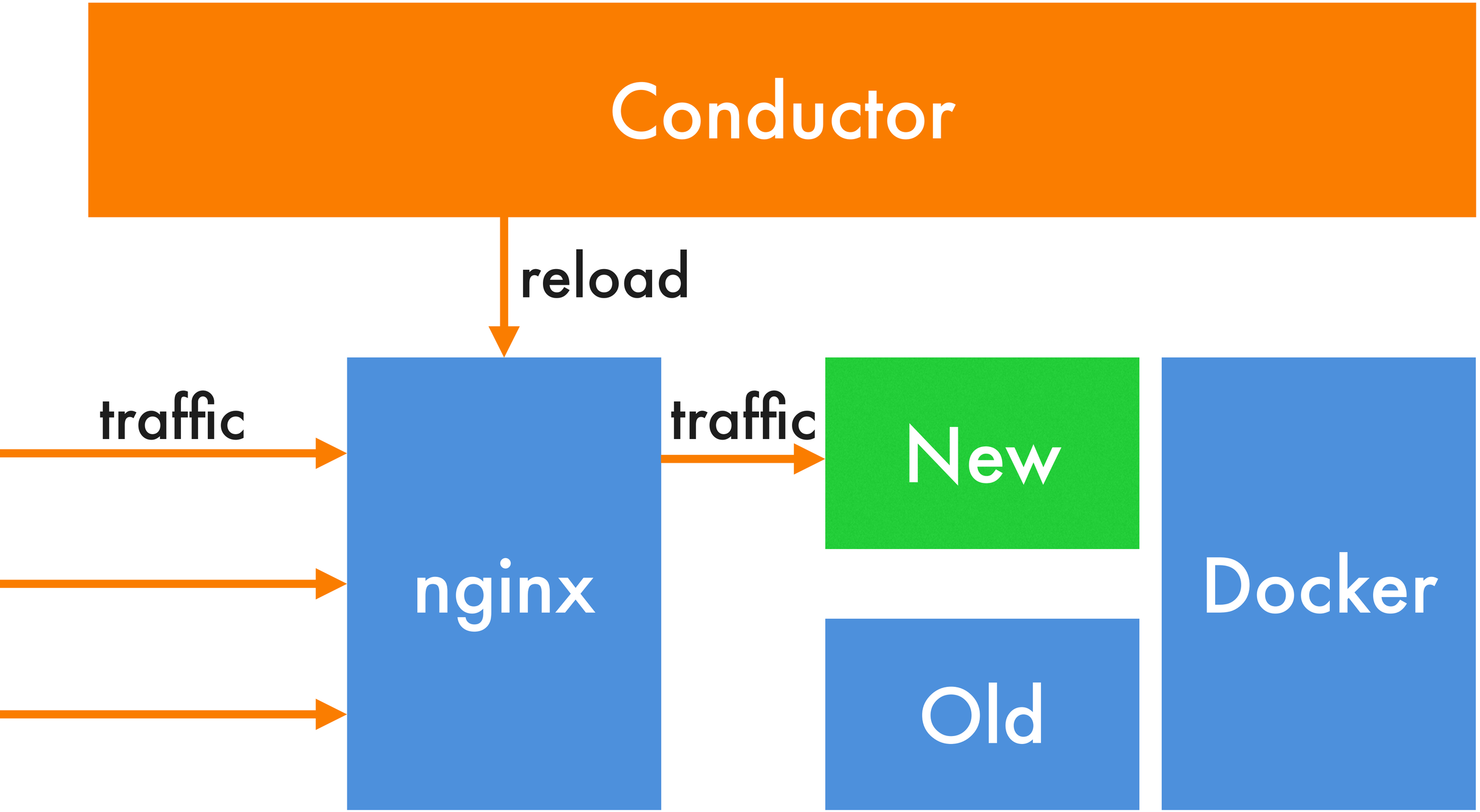
Docker

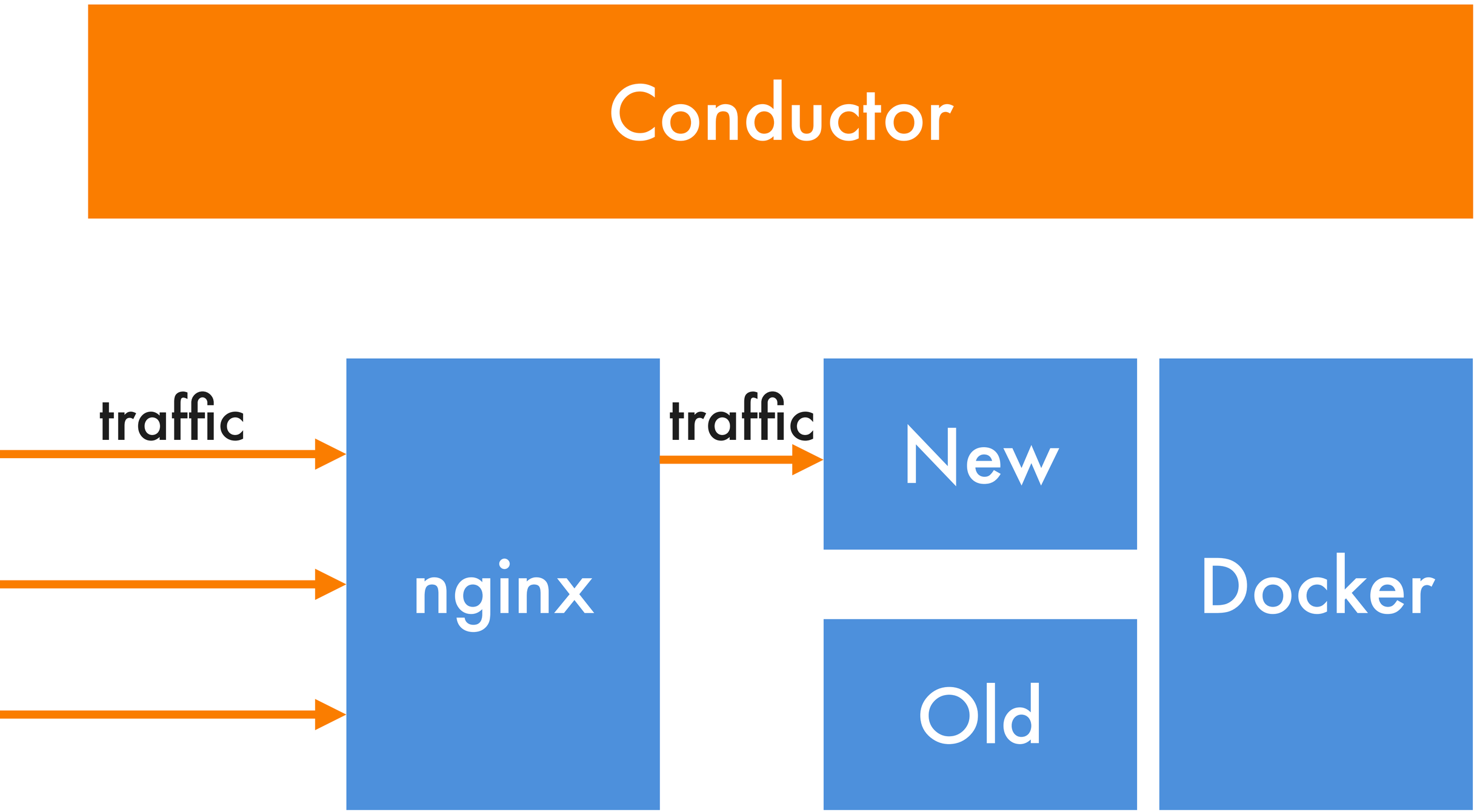

Conductor
traffic
nginx
traffic
Old
Docker

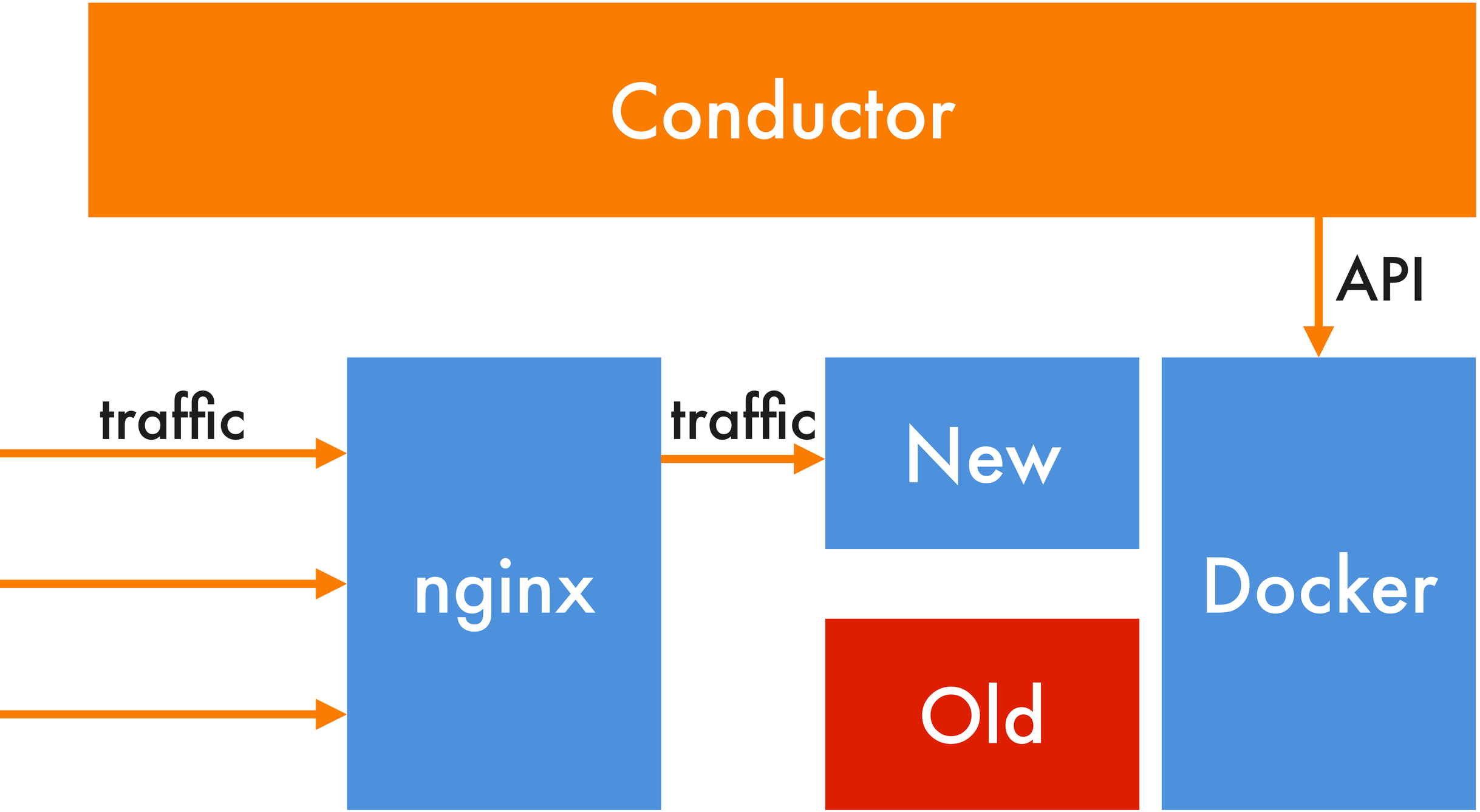

Conductor
API
traffic
nginx
New
Old
traffic
Docker

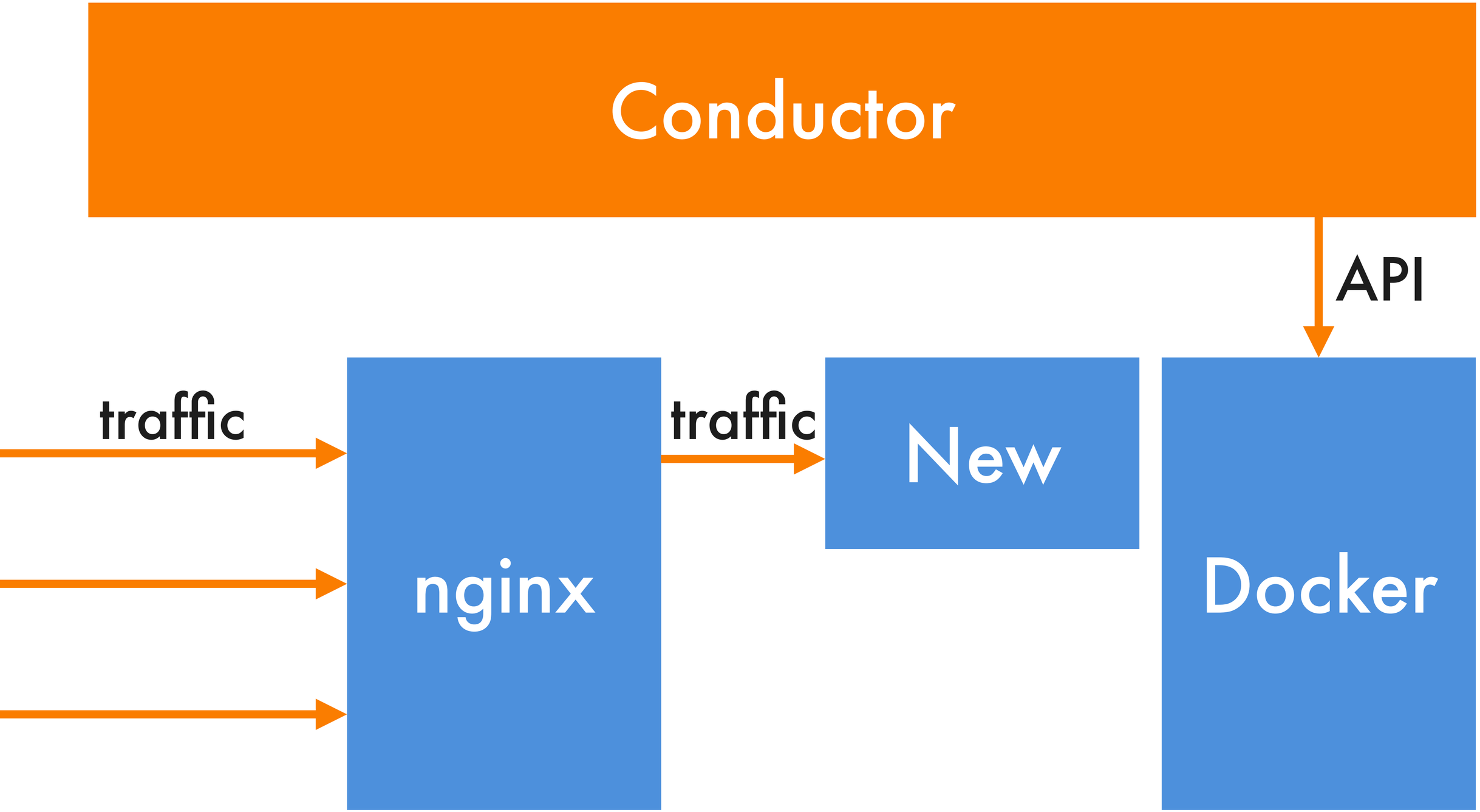

Conductor
health check
traffic
nginx
New
Old
traffic
Docker

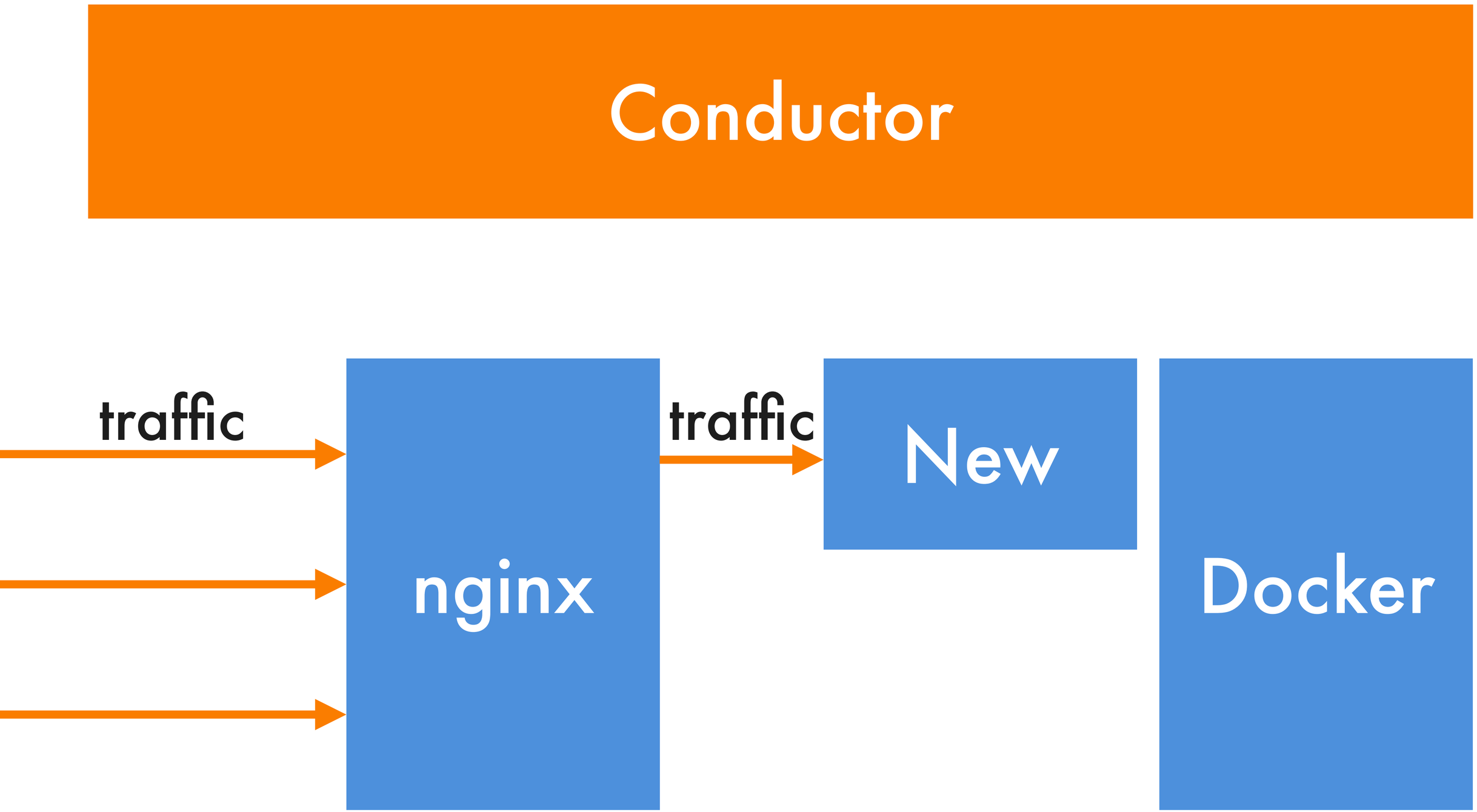

Conductor
config
traffic
nginx
New
Old
traffic
Docker


Conductor
reload
traffic
traffic
nginx
New
Old
Docker


Conductor
traffic
traffic
nginx
New
Old
Docker


Conductor
API
traffic
traffic
nginx
New
Old
Docker


Conductor
API
traffic
traffic
nginx
New
Docker


Conductor
traffic
traffic
nginx
New
Docker

What about cron jobs?

```
conductor cron generate
  --id gocardless_cron_production
  --revision 279d903588
```

```
conductor cron generate
  --id gocardless_cron_production
  --revision 279d903588
```

```
gocardless/
  ▼ app/
      payment_stuff.rb
  ▶ lib/
    generate-cron
```

```
# Clean up expired API tokens

*/30 * * * *  scripts/cleanup-api-tokens
```

```
# Clean up expired API tokens

*/30 * * * *  /usr/local/bin/conductor run
  --id gocardless_cron_production
  --revision 279d903588
  scripts/cleanup-api-tokens
```

Service definitions

Single-node orchestration

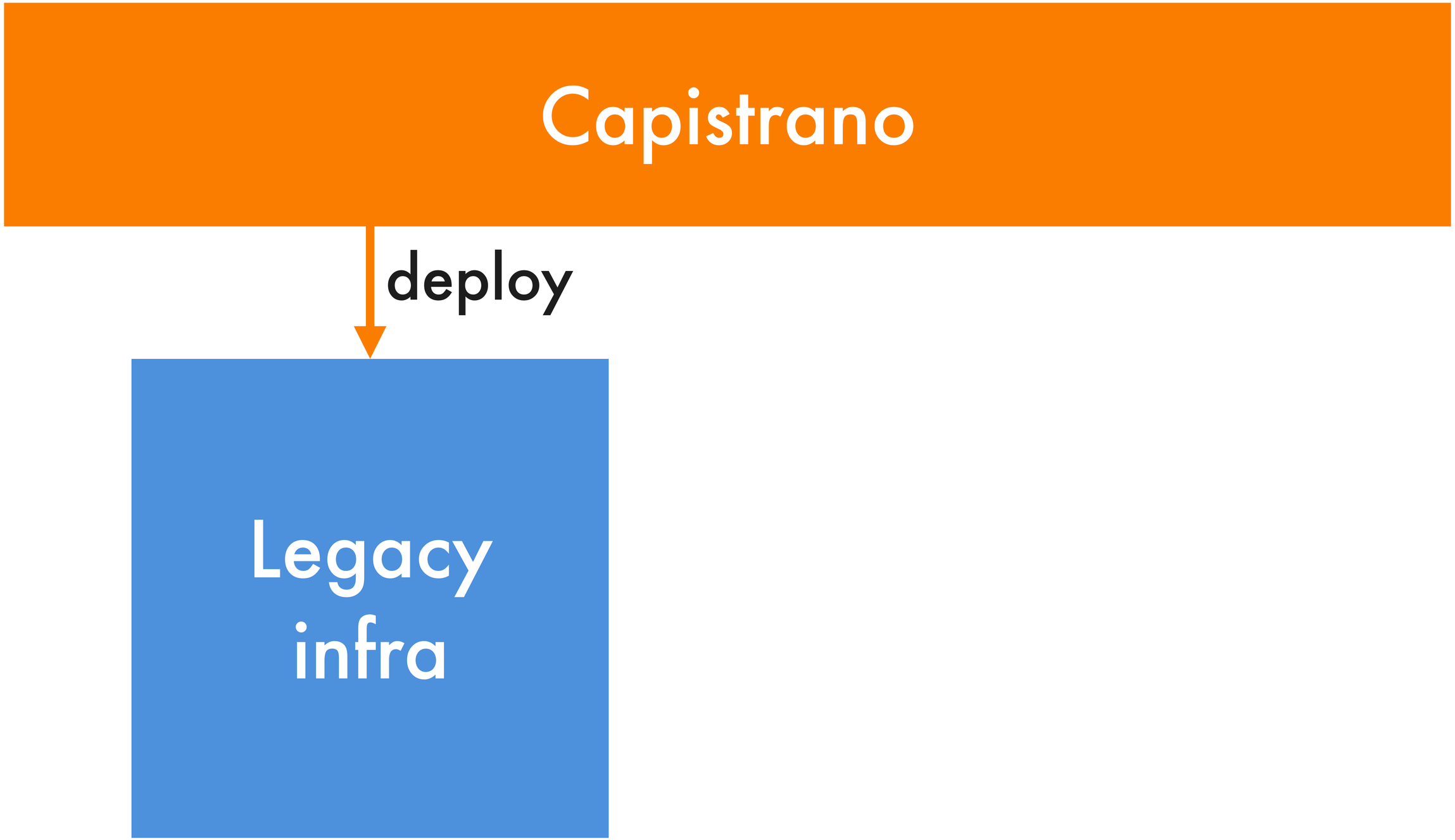
Service definitions

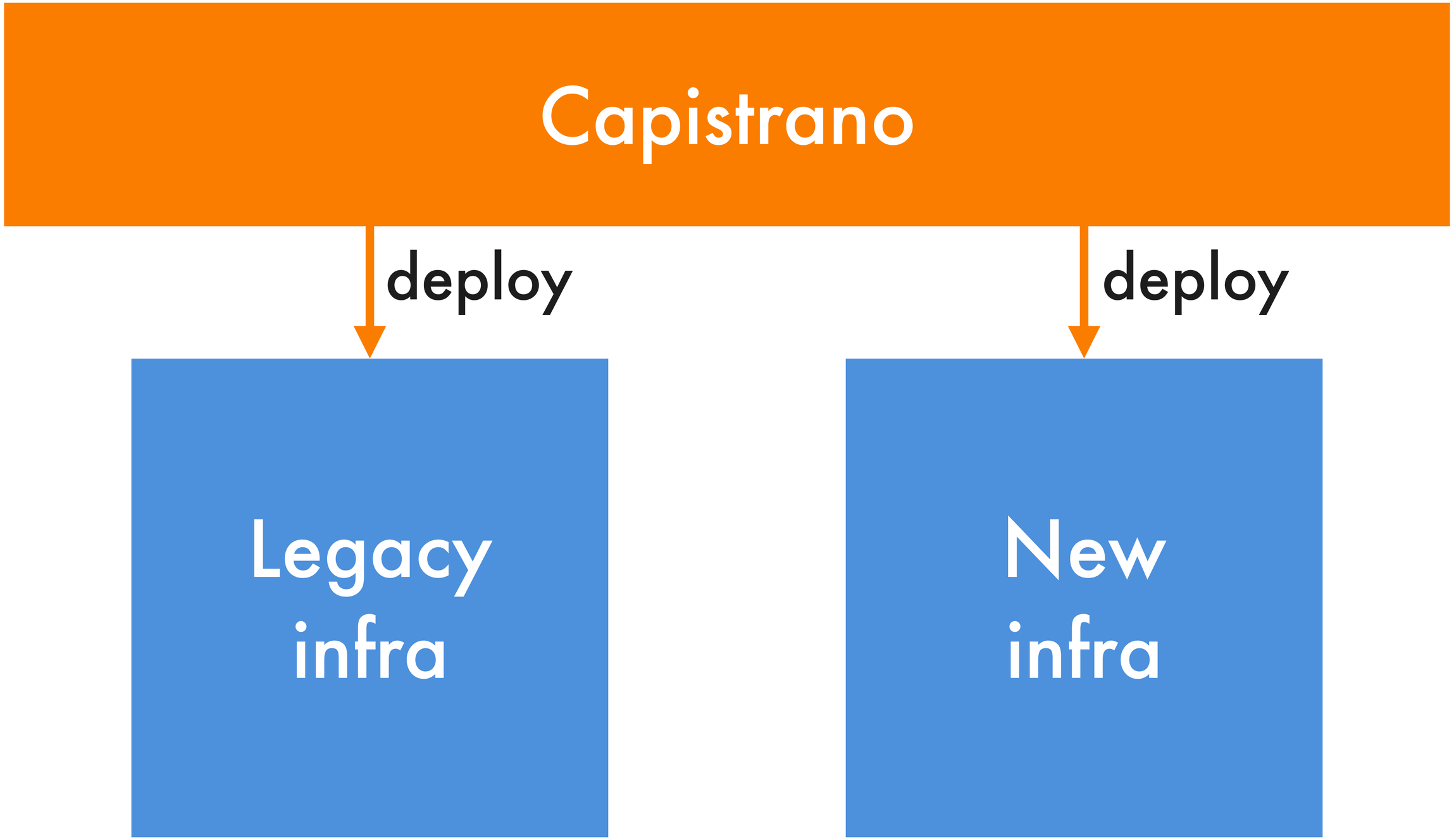
Single-node orchestration

A way to trigger deploys

Keep it boring

Keep it in Capistrano


Capistrano
deploy
Legacy
infra

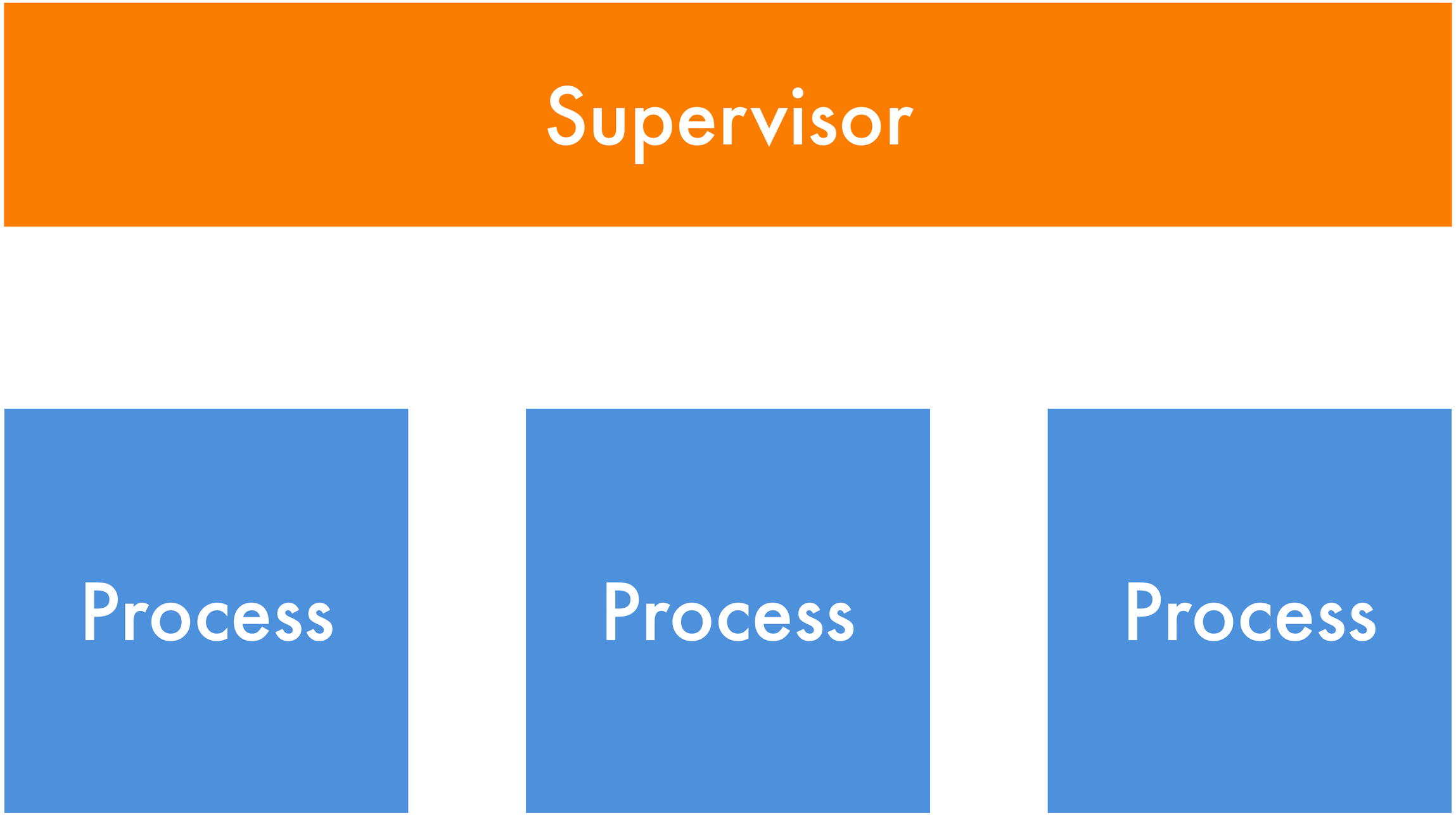

Capistrano
deploy
deploy
Legacy infra
New infra

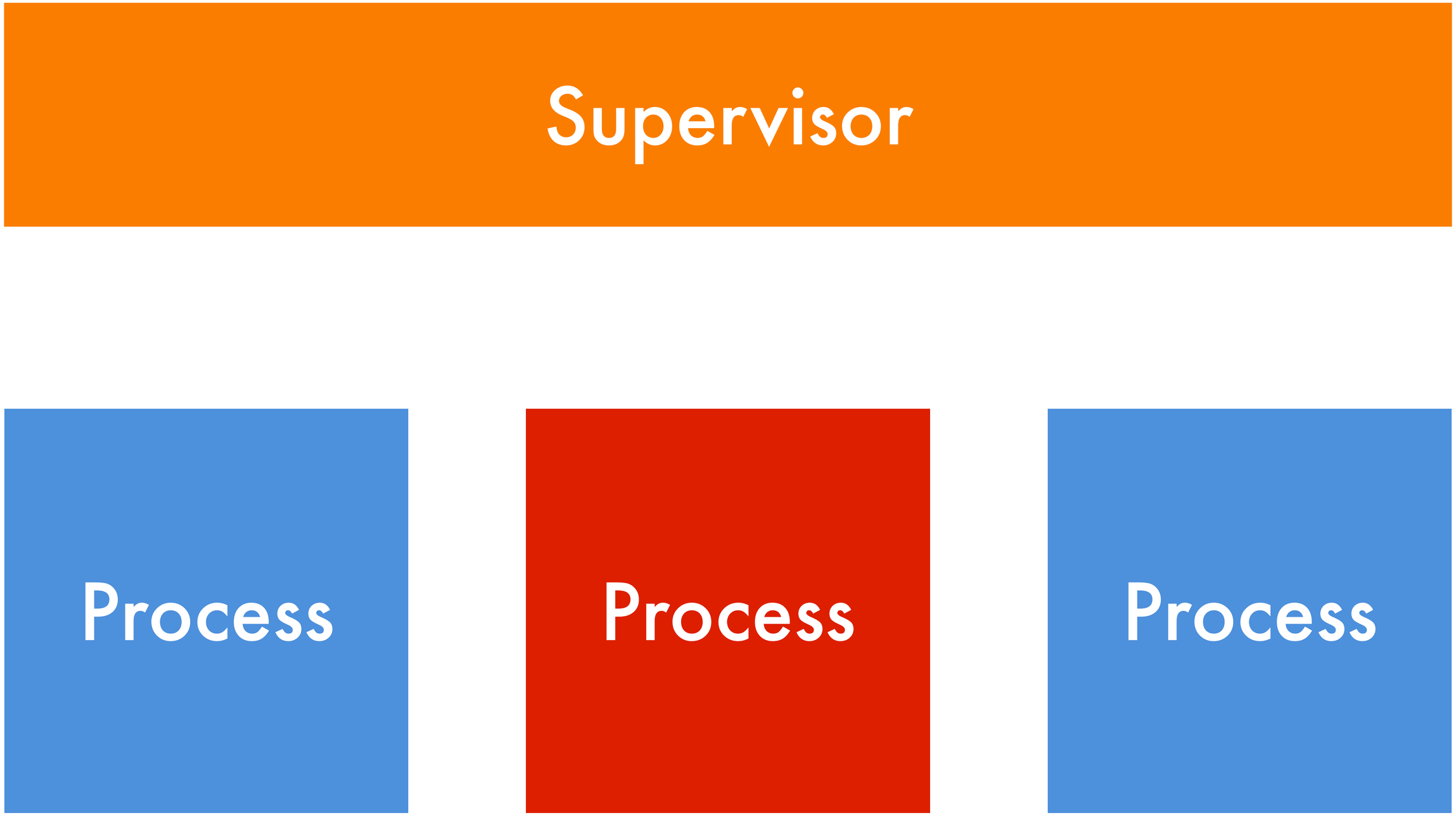
Help developers do their job

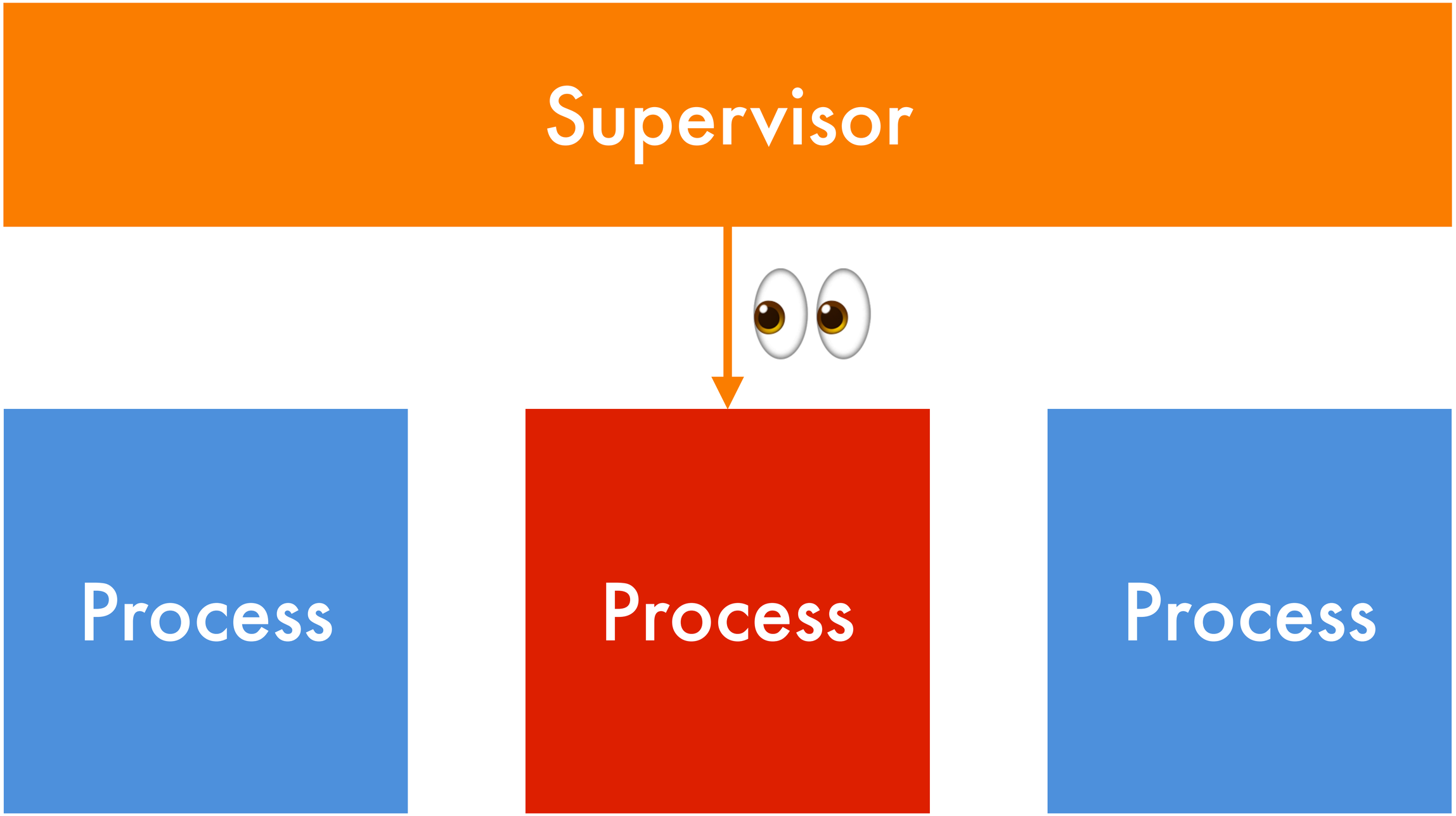
1 thing missing

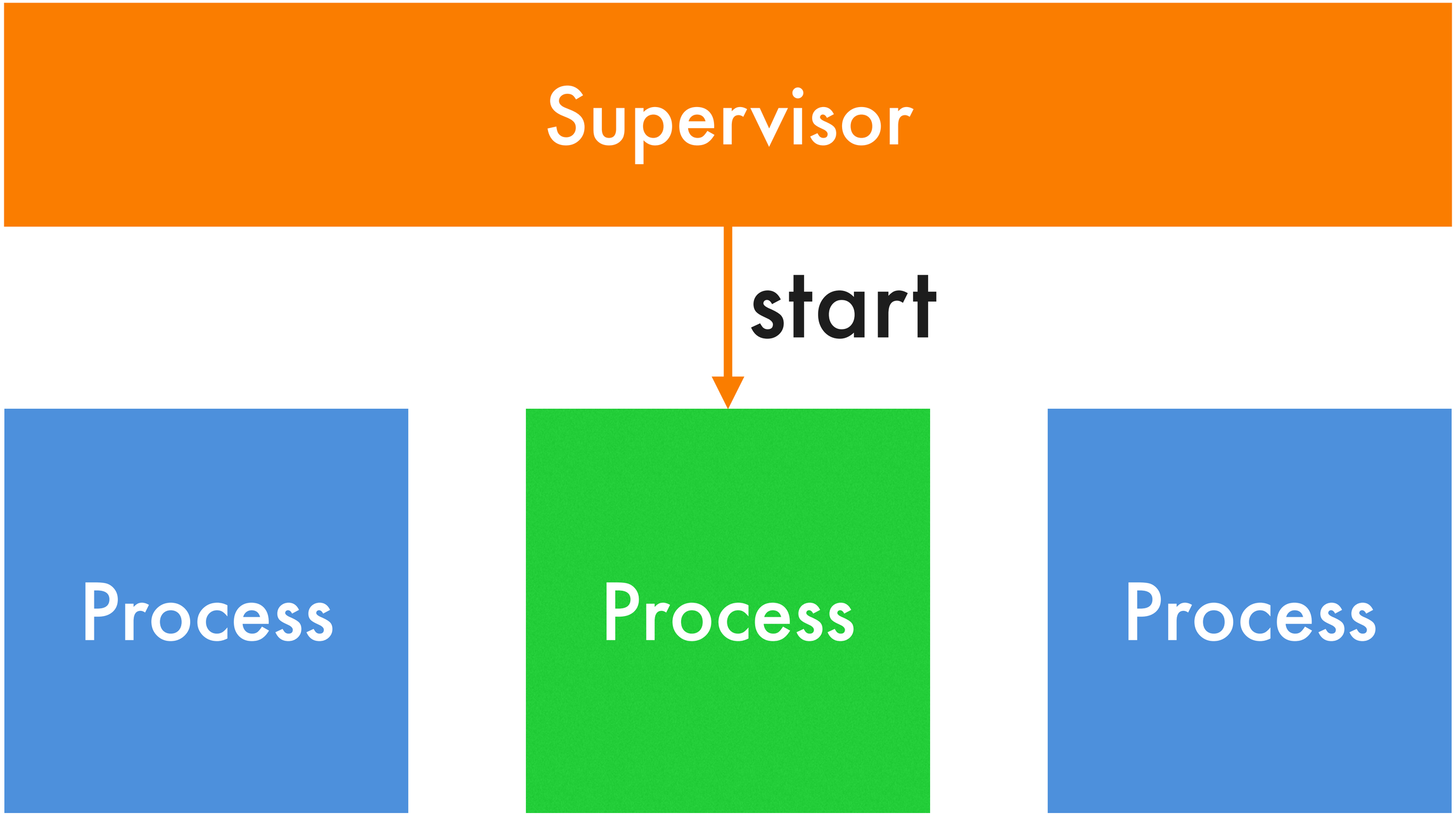
“Hey, this process died.”

– *a computer*


Supervisor
Process
Process
Process


Supervisor
Process
Process
Process


Supervisor
Process
Process
Process


Supervisor
start
Process
Process
Process

Some supervisors:

Some supervisors:

- Upstart

Some supervisors:

- Upstart
- systemd

Some supervisors:

- Upstart
- systemd
- runit

Those didn't play well with Docker

Docker restart policies

We didn't get along well

Hard to stop

Hard to stop

or

Gave up entirely

We built a process supervisor 😬

```
conductor supervise
```

Specifically:

Specifically:

– check number of containers

Specifically:

- check number of containers
- health check each container

Specifically:

- check number of containers
- health check each container

Specifically:

- check number of containers
- health check each container
- restart if either fails

Specifically:

- check number of containers
- health check each container
- restart if either fails
- at most every 5 seconds

```
# service conductor-supervise stop
```

We don't want this piece of software

Deploying software reliably

How containers can help

Other options

Deploying software reliably

How containers can help

Other options

systemd + rkt

Supervisor: systemd

Supervisor: systemd

Containers: rkt

To fit our usage:

To fit our usage:

– Conductor generates systemd config

To fit our usage:

- Conductor generates systemd config
- systemd manages processes

To fit our usage:

- Conductor generates systemd config
- systemd manages processes
- Delete `conductor supervise`

To fit our usage:

- Conductor generates systemd config
- systemd manages processes
- Delete `conductor supervise`
- HTTP health checks???

systemd + rkt

or

VMs + autoscaling

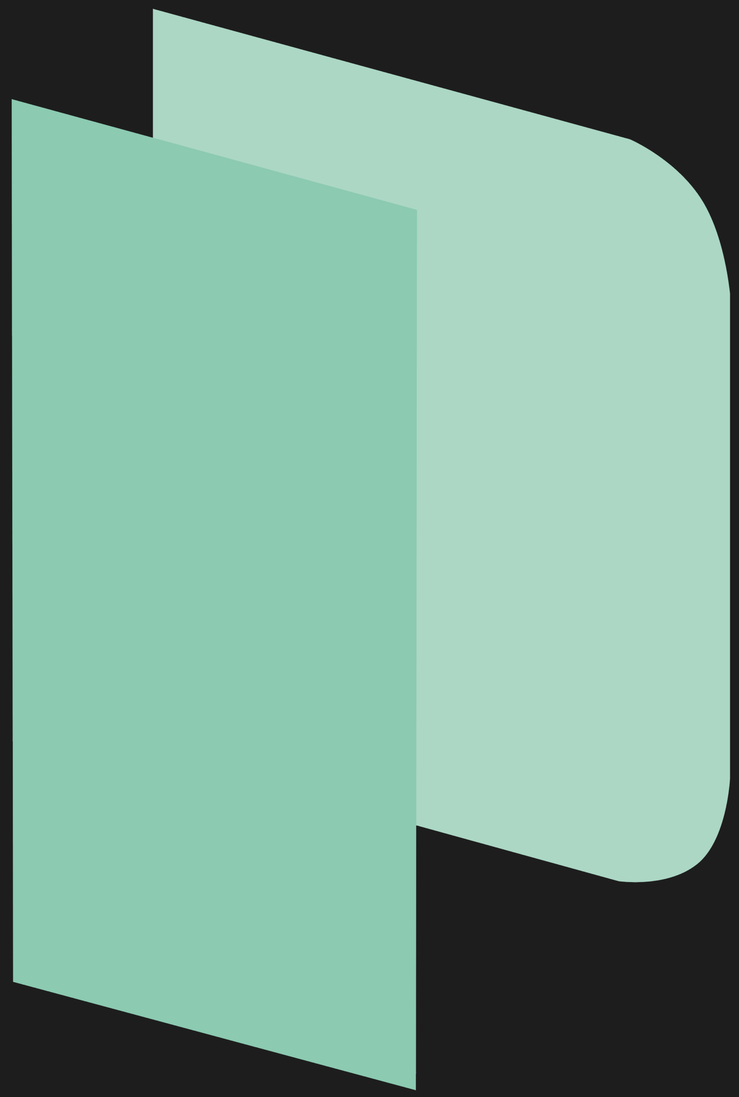
Supervisor: autoscaling

Supervisor: autoscaling

Containers → VMs


Google


amazon



Meta-thoughts

~~Meta-thoughts~~

Some reckons

Introduce
new infrastructure
where failure
is survivable

Non-critical batch jobs

↓

Background workers

↓

API servers

Goal state is what matters

Everything might change before your next method call

The system isn't interesting without context

Start with why

Thank you

✌️❤️

@ChrisSinjo
@GoCardlessEng

We're hiring

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Questions?

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