Immutable Server Generation

The New App Deployment

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boxfuse

About Axel Fontaine

- Founder and CEO of Boxfuse
- Over 15 years industry experience
- Continuous Delivery expert
- Regular speaker at tech conferences
- JavaOne RockStar in 2014

@axelfontaine

flywaydb.org

boxfuse

boxfuse.com

about

questions

Let’s start with a small story

Incandescent Bulb
60 W

LED Bulb
10 W

http://commons.wikimedia.org/wiki/File:Gluehlampe_01_KMJ.jpg

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Heater that gives off
a little bit of light

Light that gives off
a little bit of heat

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Edison Screw

The electricity company's responsibility

Simple, stable, standards-compliant interface with a clear contract

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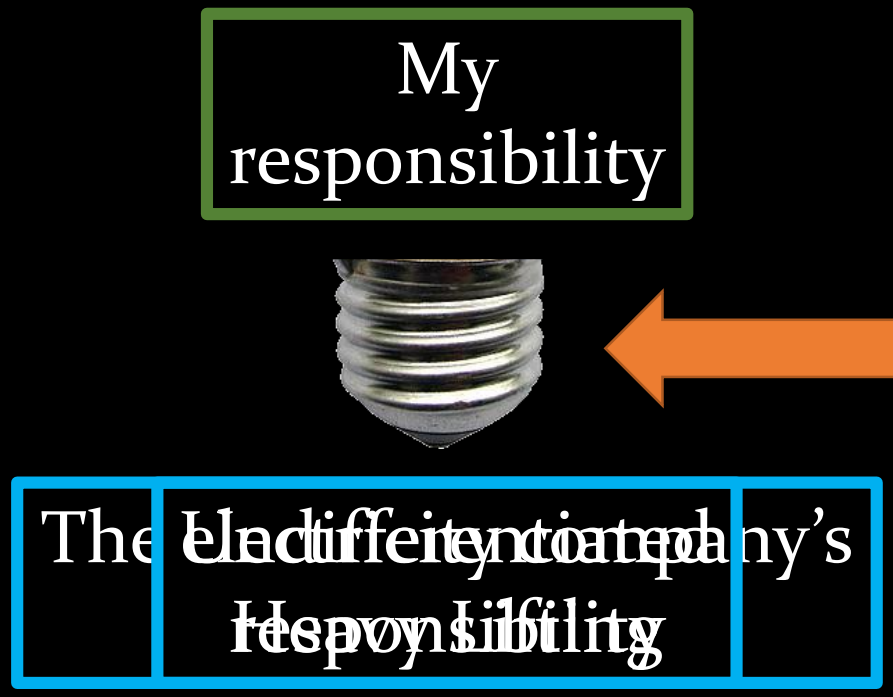
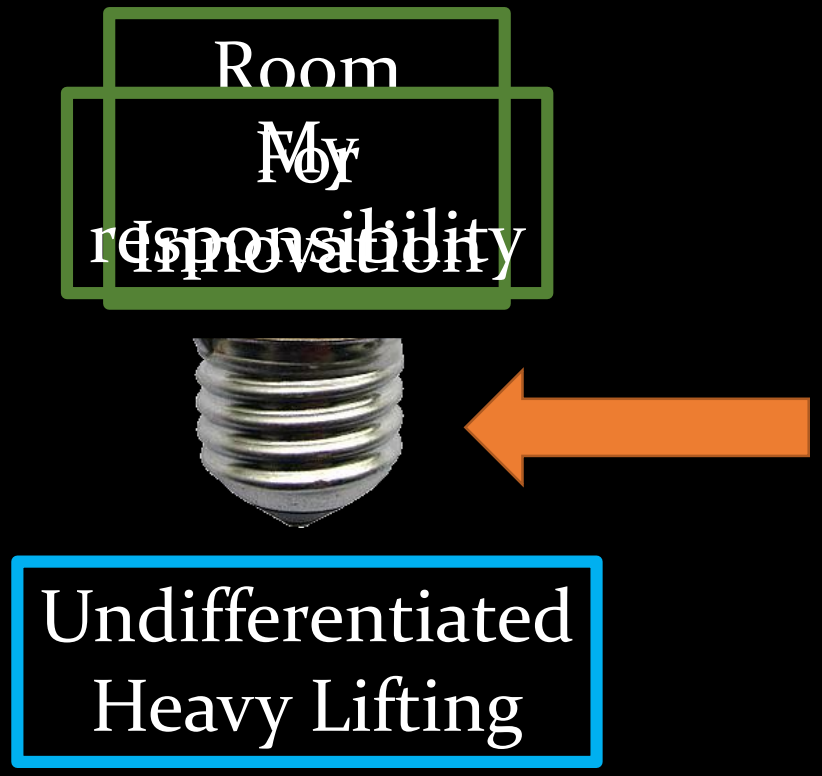


Simple, stable, standards-compliant interface
with a clear contract

boxfuse



Simple, stable, standards-compliant interface with a clear contract

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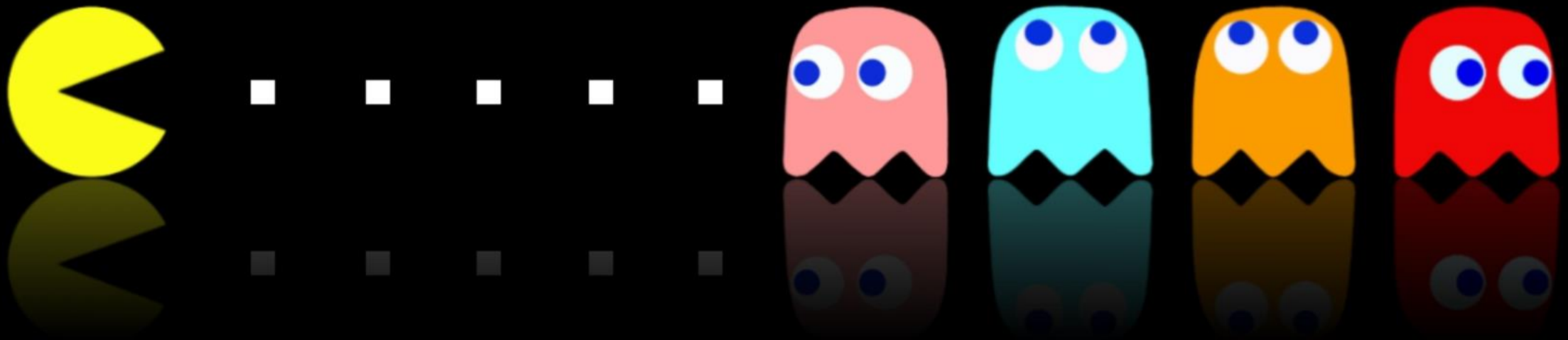
back to IT infrastructure …

POLL:
what type of infrastructure are you running on?

- On Premise
- Colocation
- Root Server
- Cloud

How did this evolve ?

sometime in the 20th century …



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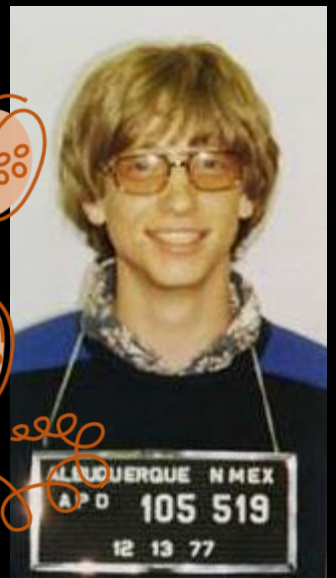

ALBUQUERQUE N MEX
105 519
12 13 77

Microsoft
Microsoft
BackOffice
Microsoft
Windows NT
Server

ON PREM = + +

Challenges

- Power, Network, Cooling
- Physical Security
- Physical Space
- Procurement, Vendor Management
- Capacity Planning
- Financing
- OS + Patches
- App + Updates

ON PREM =

+

+

Our responsibility

+

+

Our responsibility

Their responsibility

COLO =

+

+

Simple, stable, standards-compliant interface:

(19” Rack, AC Power, Ethernet, …)

COLO =

+

+

Undifferentiated Heavy Lifting

Our responsibility

Can change as long as it complies with the interface contract

Their responsibility

ROOT SERVER =

+ Undifferentiated Heavy Lifting

Our responsibility

Can change as long as it complies with the interface contract

ROOT SERVER =

+ Undifferentiated Heavy Lifting

Simple, stable, standards-compliant interface

Software <-> Hardware

+

Undifferentiated
Heavy Lifting

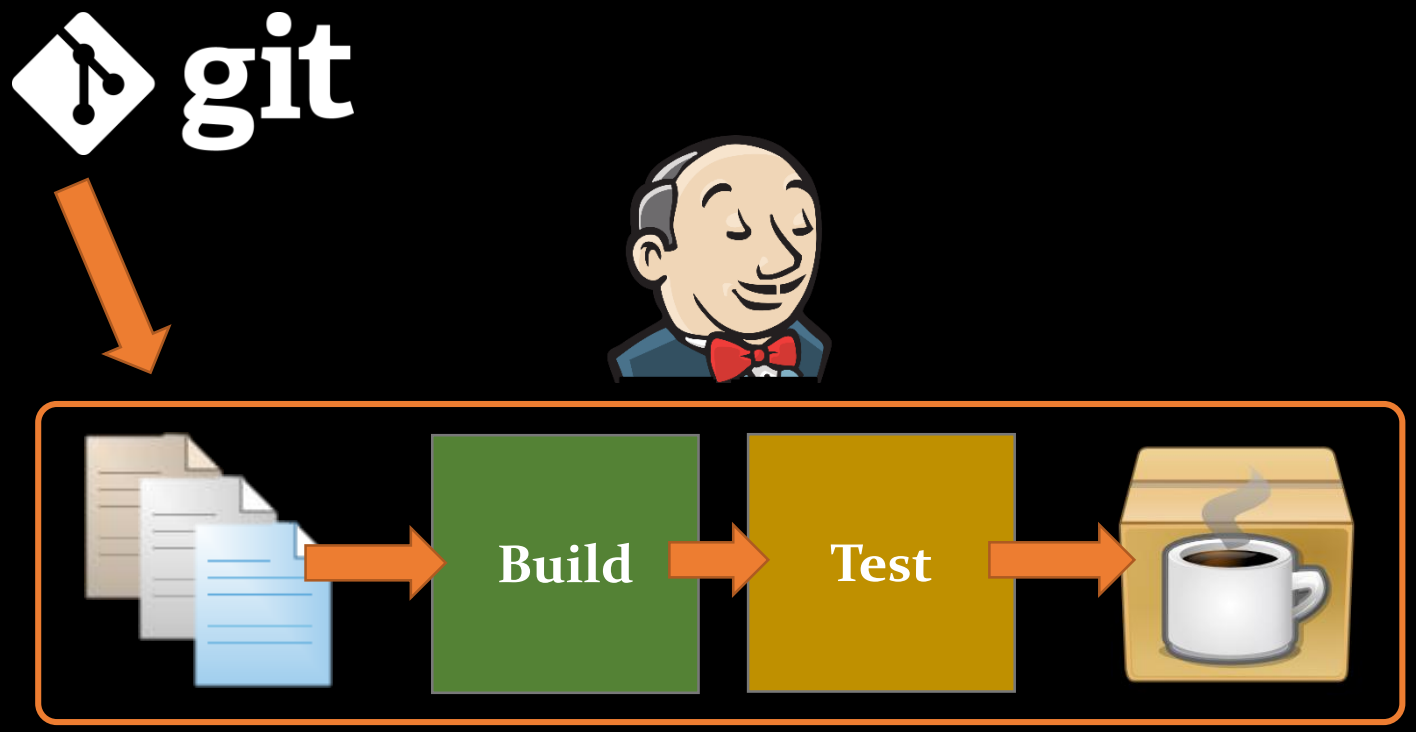
Simple, stable, standards-compliant interface

Could this be our industry's Edison Screw?

Let’s talk about software

POLL:
which level of automation are you at?

- Build
- Unit Tests
- Continuous Integration
- Acceptance Tests
- Continuous Deployment (Code)
- Continuous Deployment (Code + DB + Configuration)
- Infrastructure



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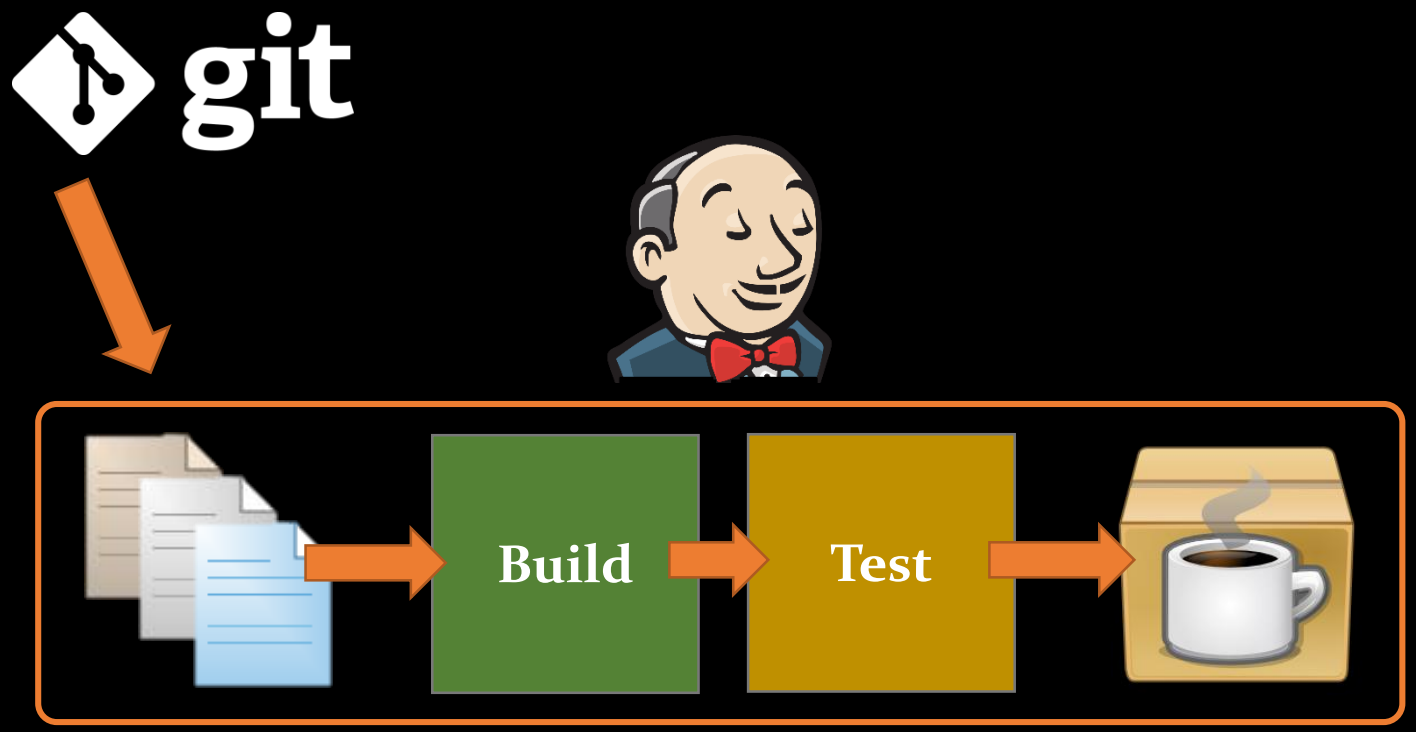

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- One immutable unit
- Regenerated after every change
- Promoted from Environment to Environment

Classic Mistake: Build per Environment

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why aren’t we doing the same
for the layers this is running on ???

what could possibly go wrong
in these other layers ???

missing software

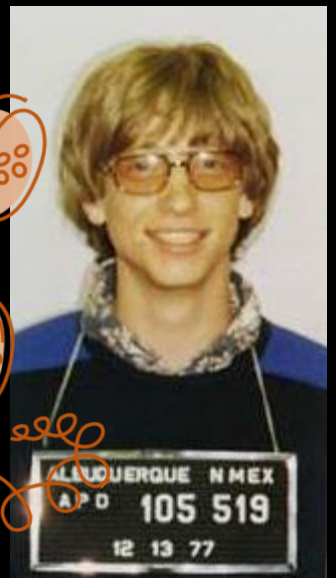
wrong name

bad version

incorrect permissions

critical resource in use

what aren’t we holding our servers to the same standards as our applications ???


ALBUQUERQUE N MEX
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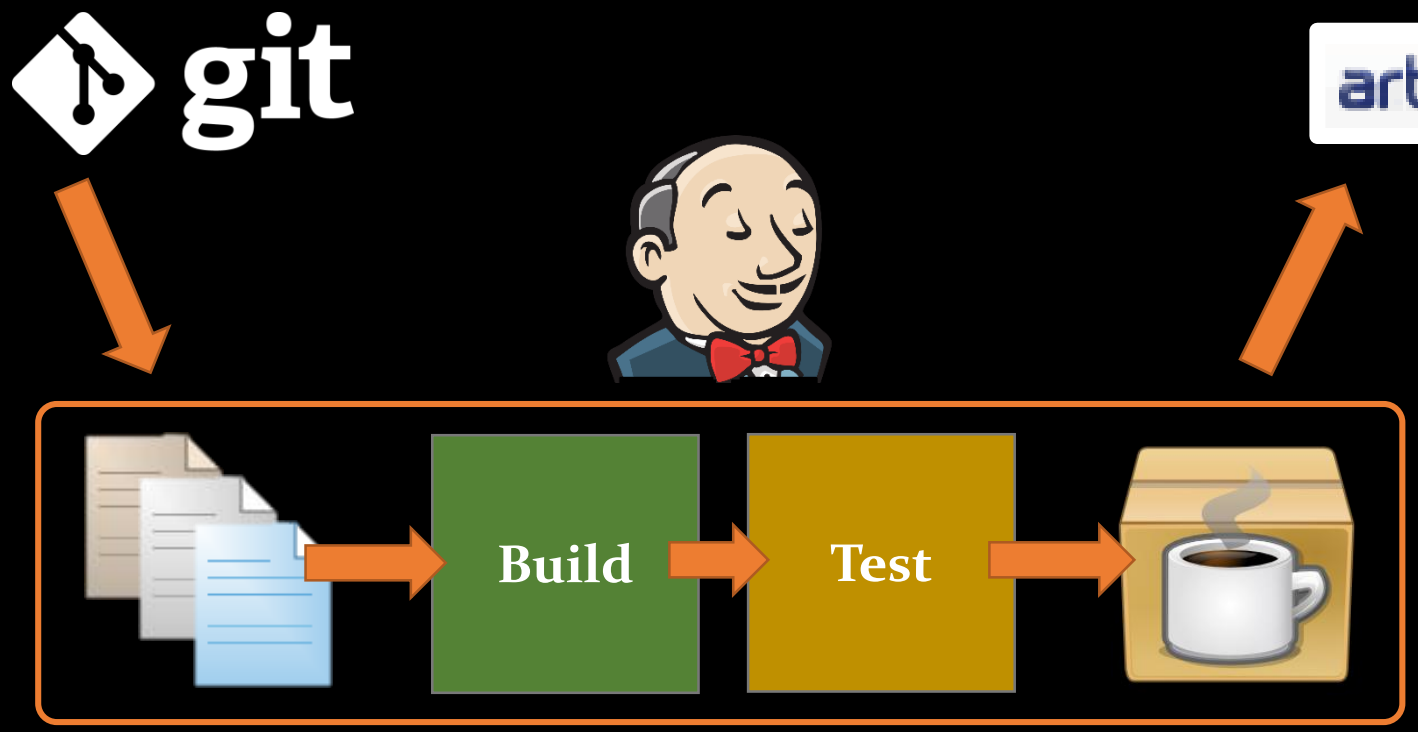
12 13 77

Microsoft
Microsoft
BackOffice
Microsoft
Windows NT
Server


git
artifactory
Build
Test

App
App Server
Language
Libraries
OS Kernel

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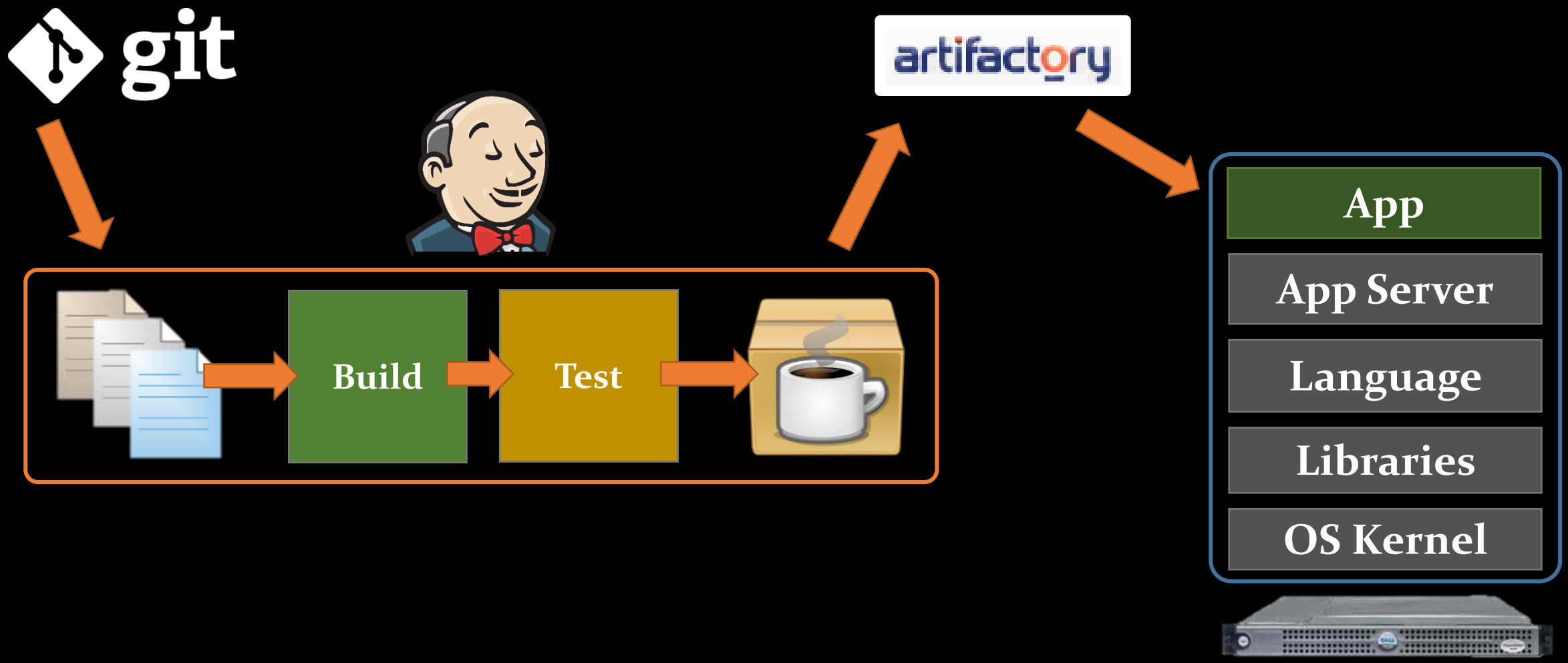
git
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App Server
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Multiple instances in multiple Environments

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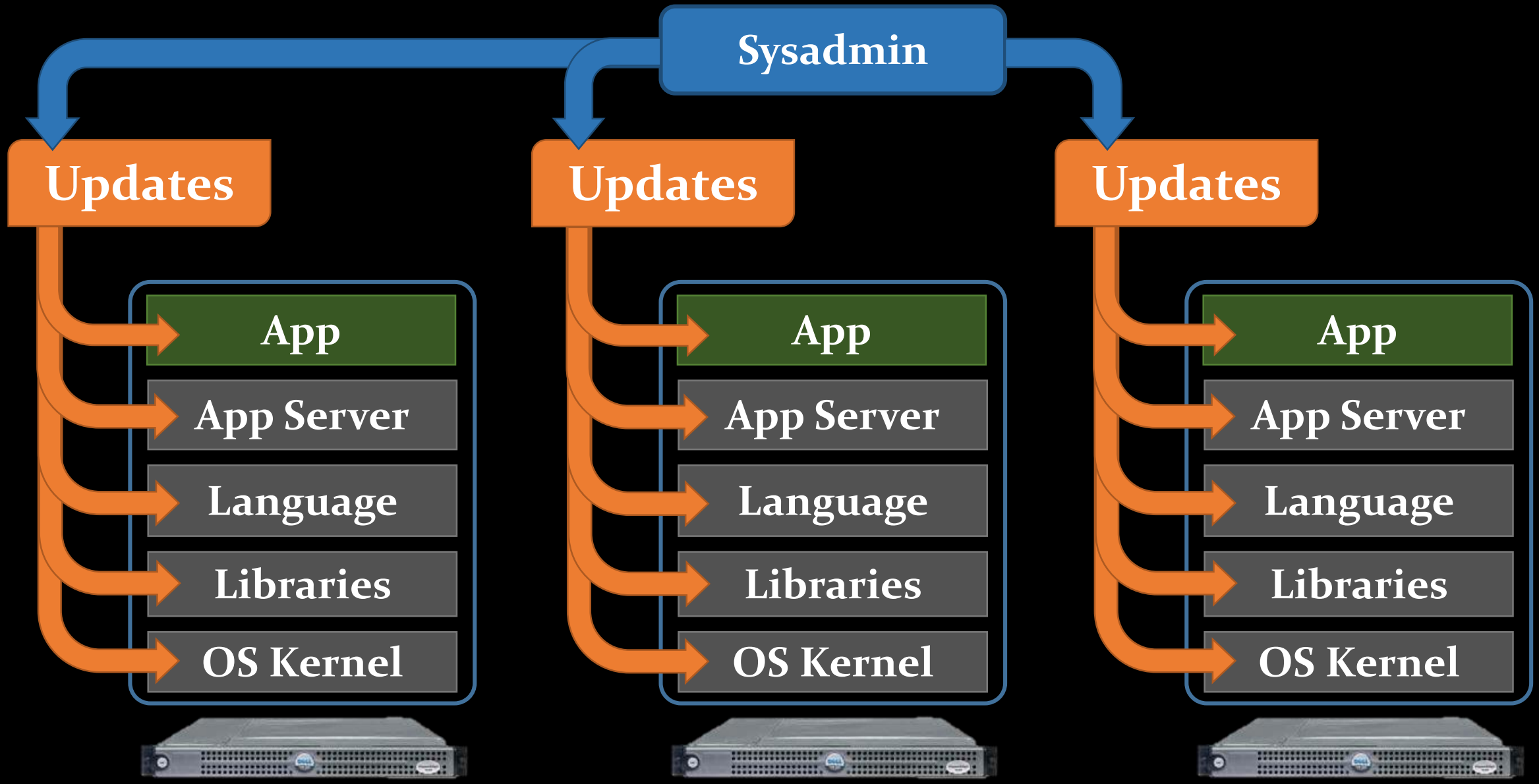
Multiple instances in multiple Environments

- All instances should be as similar as possible (any difference is a potential source of errors)
- That also includes your local Dev environment!
- Must be able to reliably provision new ones (and recreate existing ones from scratch)


Sysadmin
Updates
Updates
Updates
App
App Server
Language
Libraries
OS Kernel
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App Server
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App
App Server
Language
Libraries
OS Kernel

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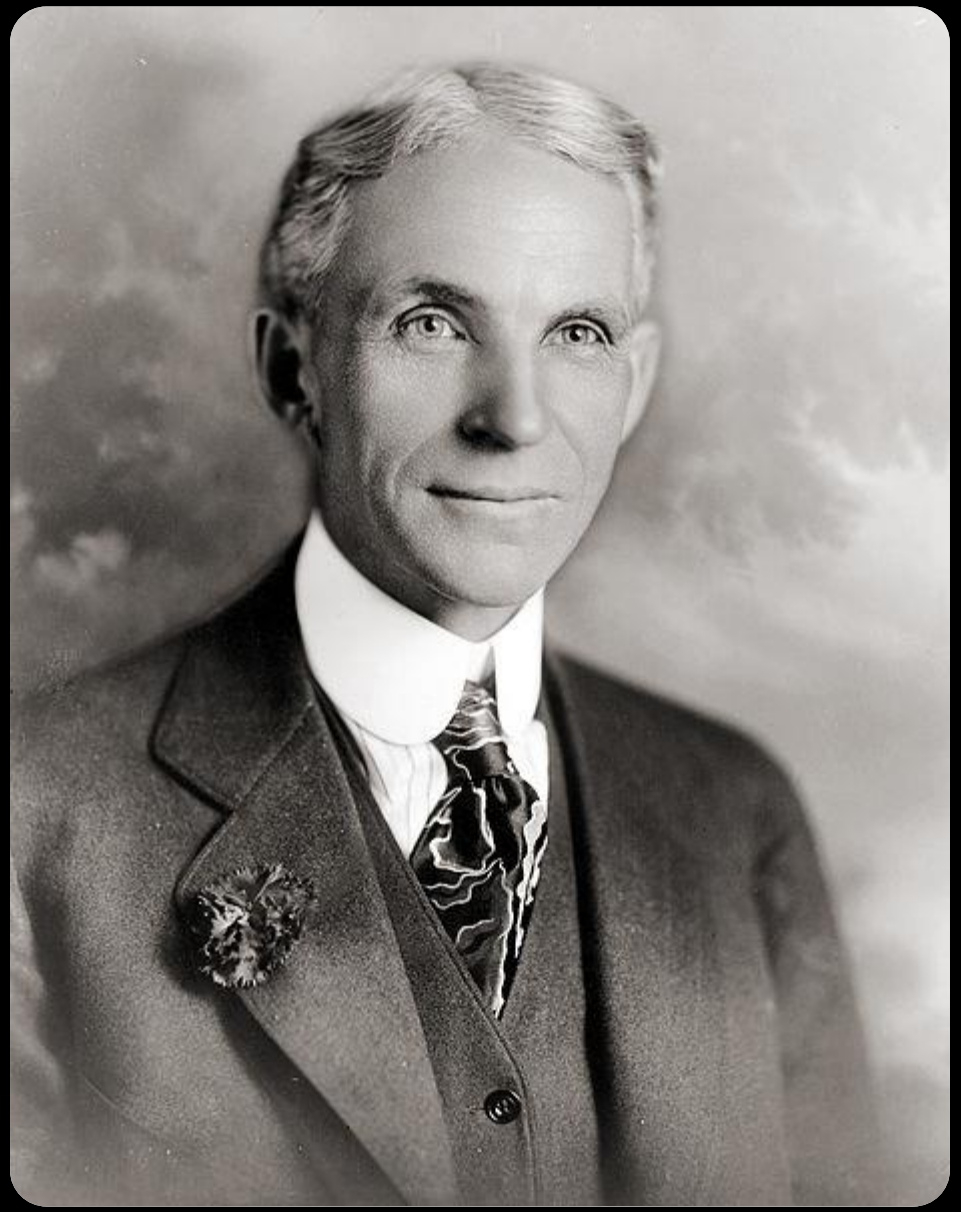

If I had asked my customers what they wanted they would have said a faster horse.

Henry Ford

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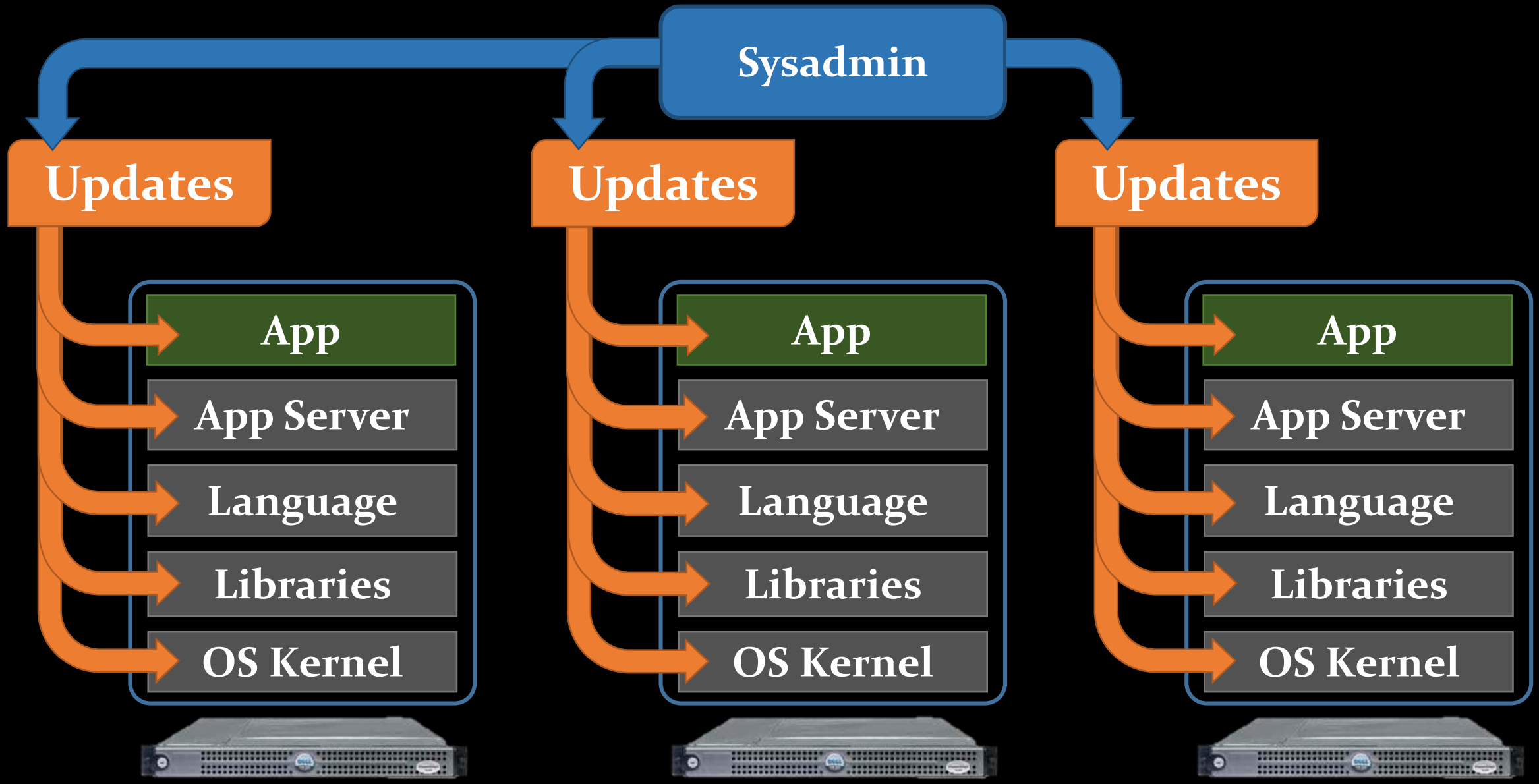
Sysadmin
Updates
Updates
Updates
App
App Server
Language
Libraries
OS Kernel
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App Server
Language
Libraries
OS Kernel

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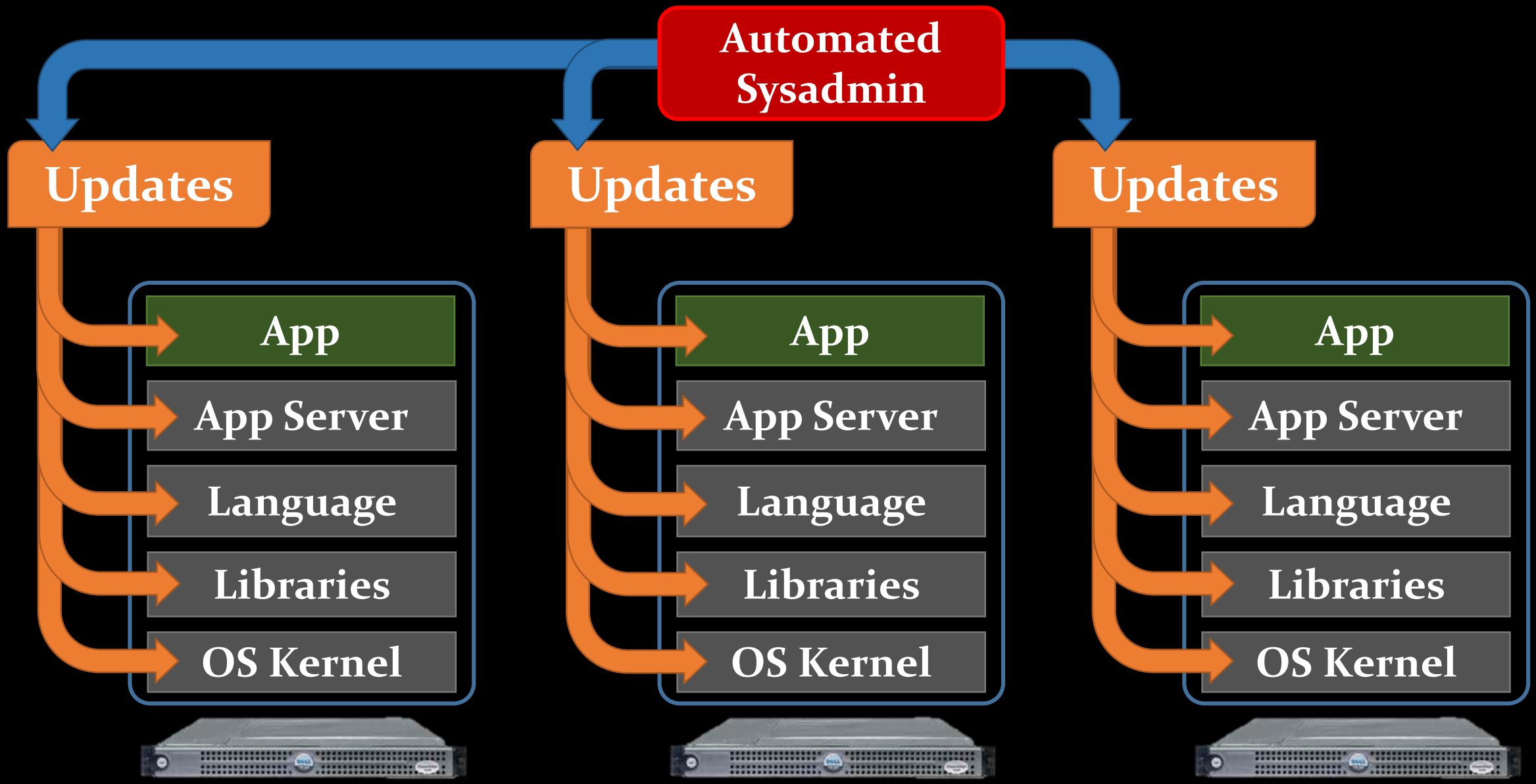
Automated Sysadmin
Updates
Updates
Updates
App
App Server
Language
Libraries
OS Kernel
App
App Server
Language
Libraries
OS Kernel
App
App Server
Language
Libraries
OS Kernel

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fast forward to 2015 …

Every day, AWS adds enough server capacity to power the whole $5B enterprise Amazon.com was in 2003.
Weekends included.

amazon web services

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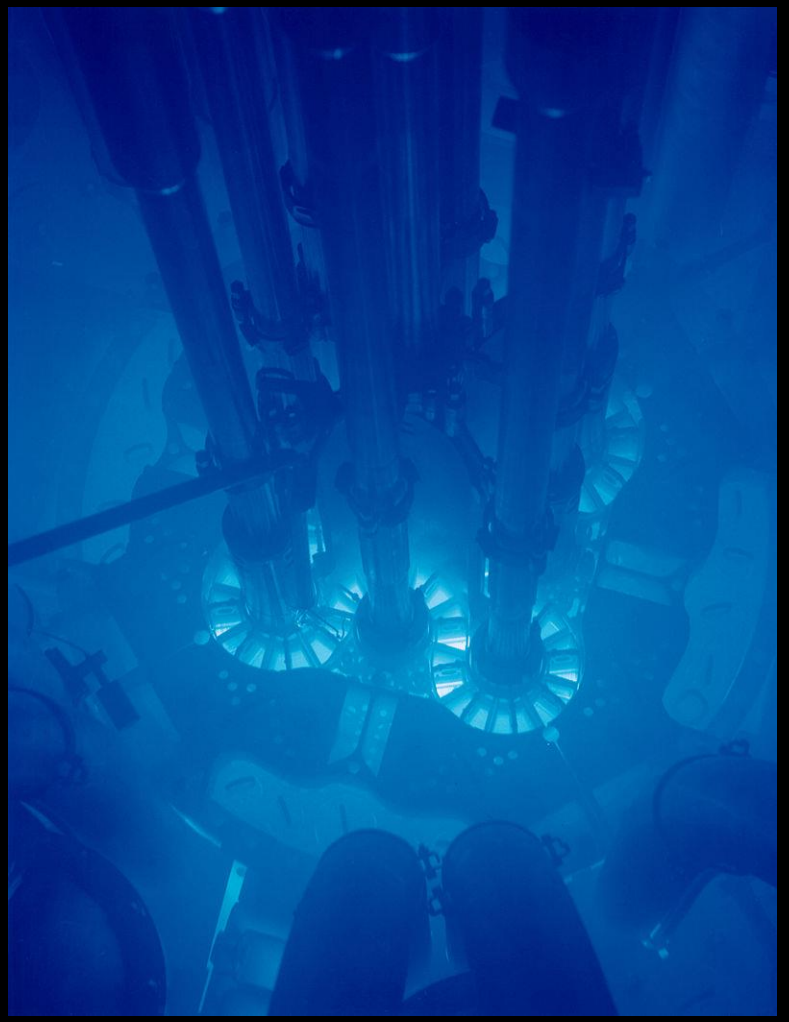
"RIAN archive 341194 Kursk Nuclear Power Plant" by RIA Novosti archive, image #341194 / Sergey Yakimov / CC BY-SA 3.0. Licensed under CC BY-SA 3.0 via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:RIAN_archive_341194_Kursk_Nuclear_Power_Plant.jpg#mediaviewer/File:RIAN_archive_341194_Kursk_Nuclear_Power_Plant.jpg

Control Plane



"Advanced Test Reactor" by Argonne National Laboratory - originally posted to Flickr as Advanced Test Reactor Core, Idaho National Laboratory. Uploaded using FlickreviewR. Licensed under CC BY-SA 2.0 via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:Advanced_Test_Reactor.jpg#mediaviewer/File:Advanced_Test_Reactor.jpg

Data Plane

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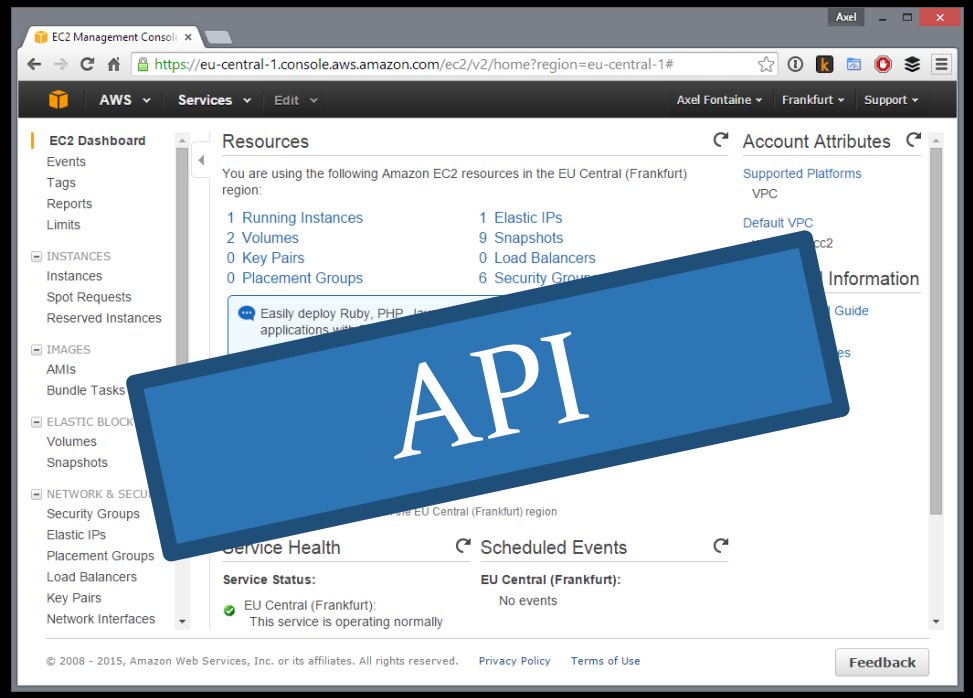

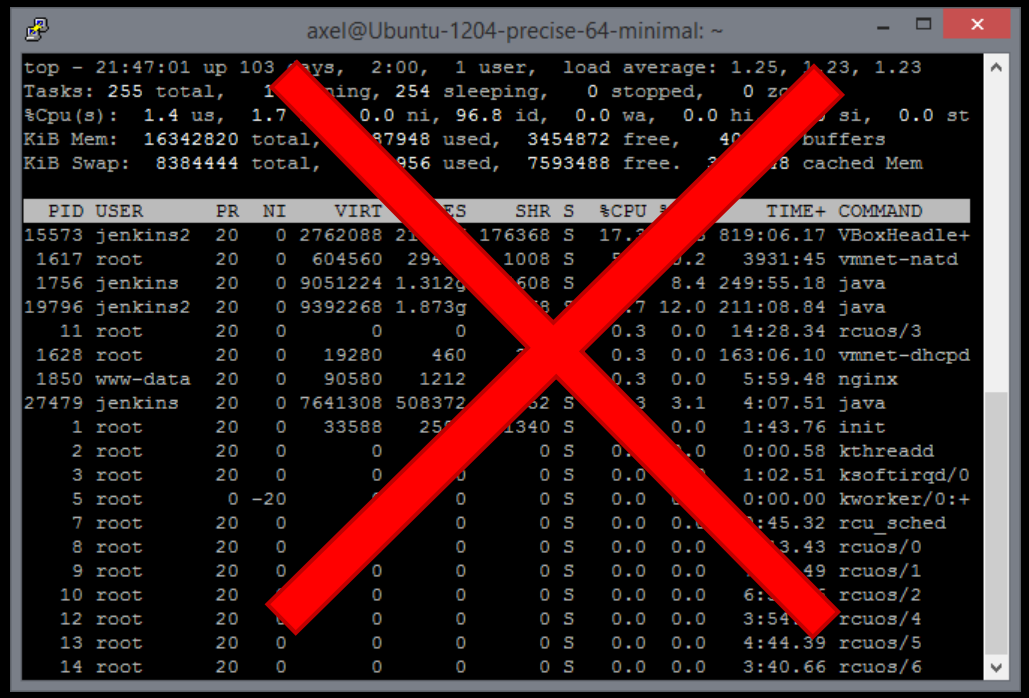

Control Plane

Data Plane

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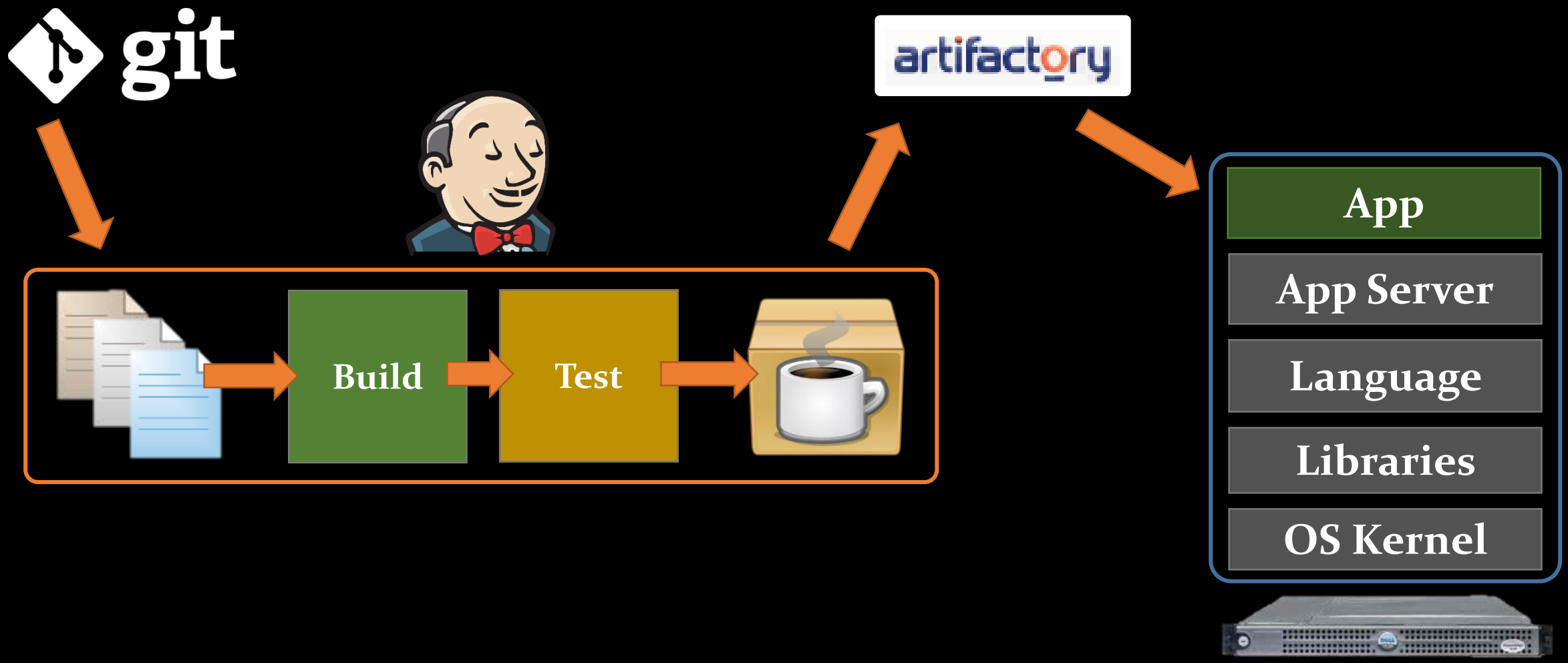
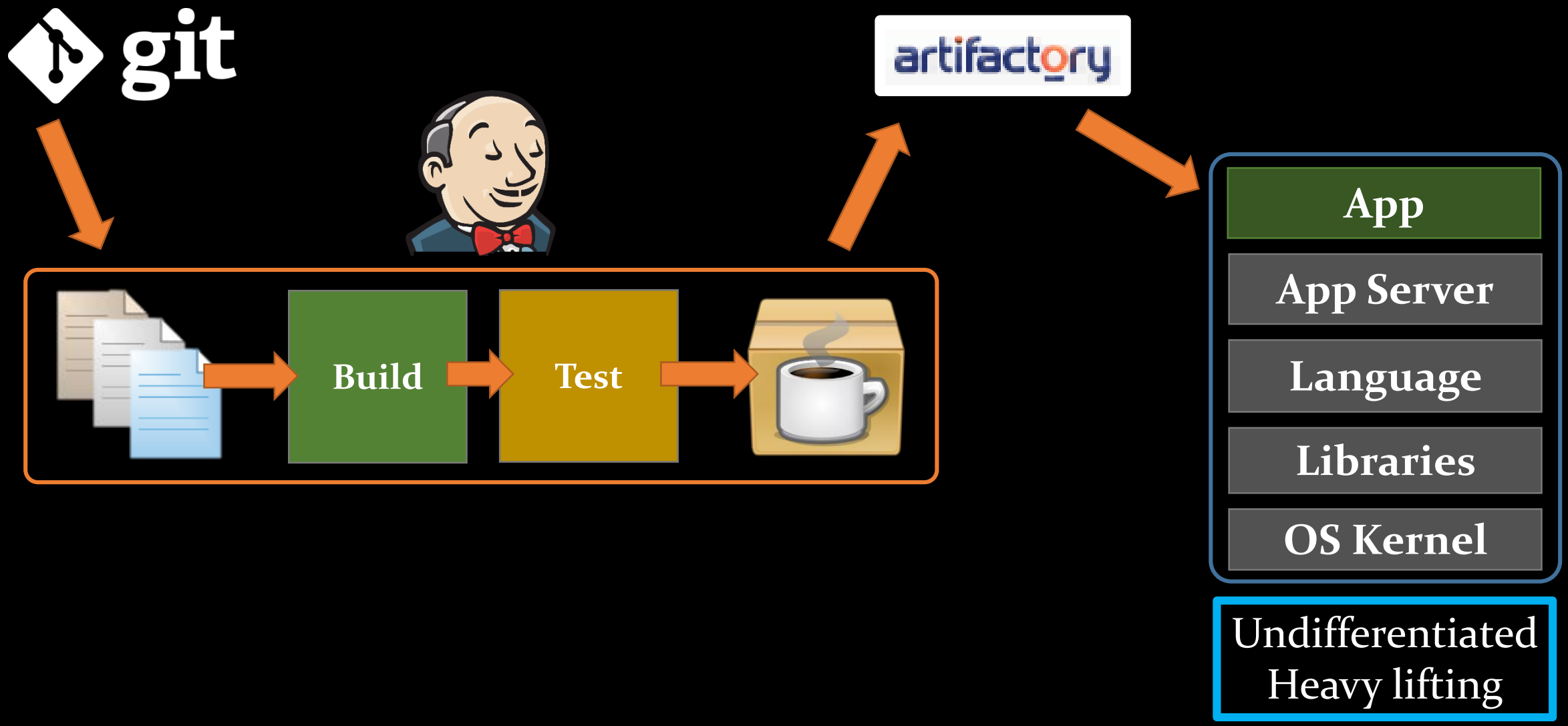
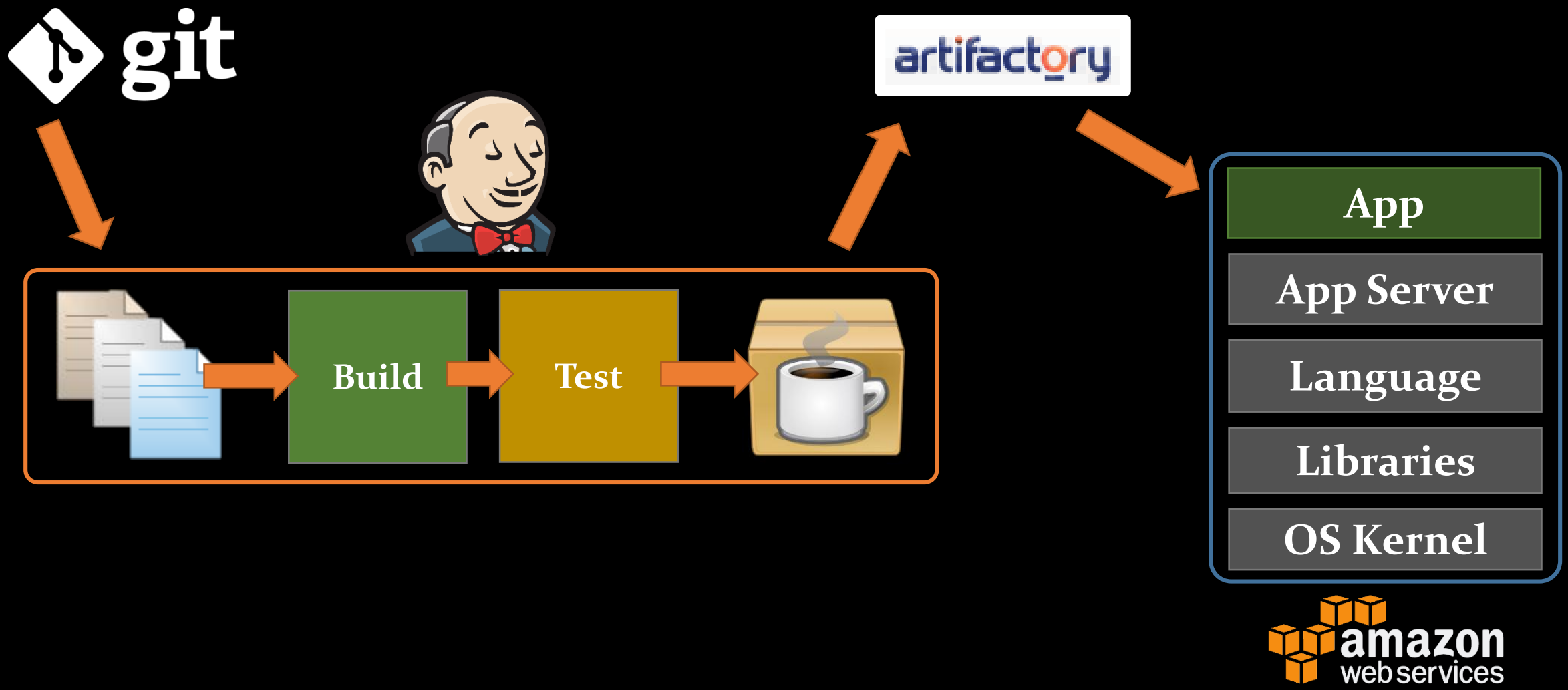
Benefits of the cloud

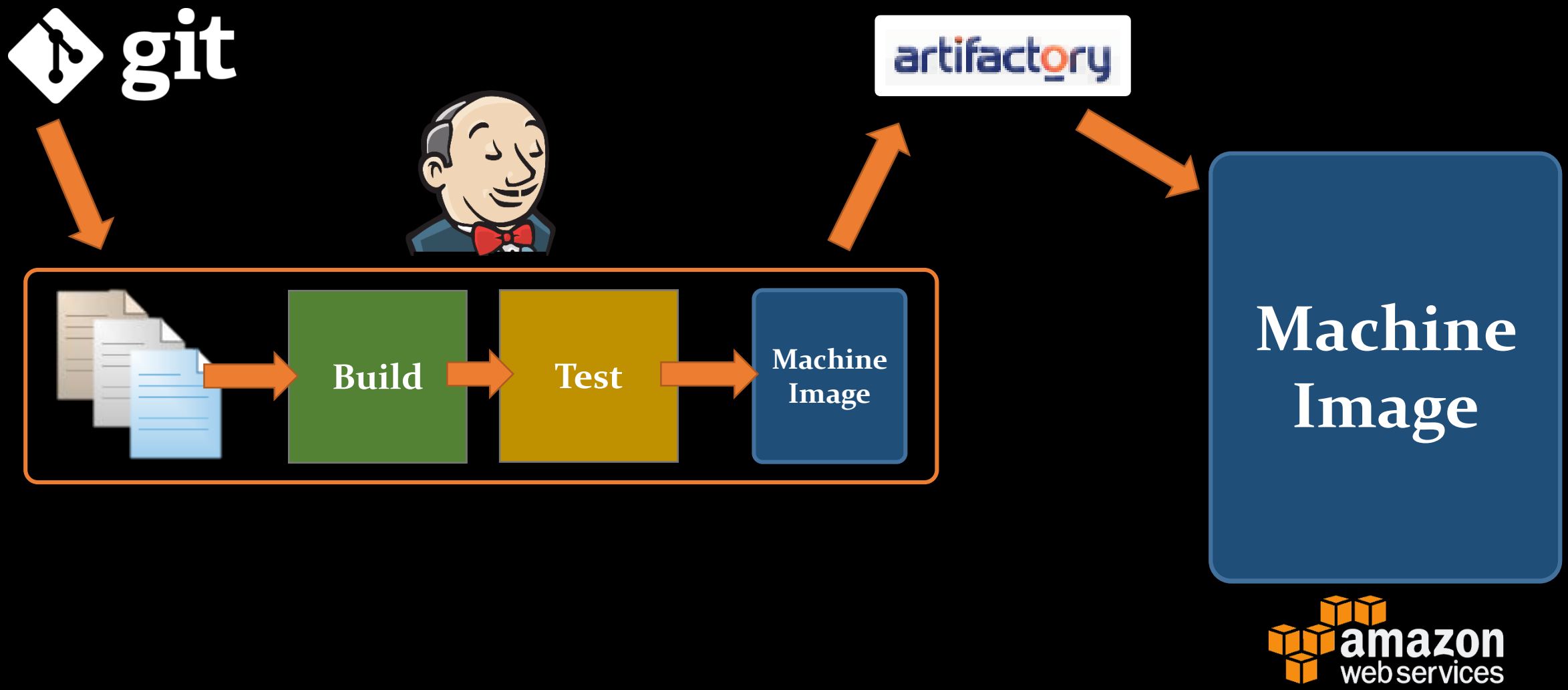
- Shift to a world of abundance
  (no more resource scarcity)
- Clean Control Plane/Data Plane split
  with API-based provisioning
- Cost-based Architectures
  with the ability to turn infrastructure off

it is time to rethink the faster horse


git
artifactory
Build
Test
App
App Server
Language
Libraries
OS Kernel


git
artifactory
Build
Test
App
App Server
Language
Libraries
OS Kernel
Undifferentiated
Heavy lifting
boxfuse


git
artifactory
Build
Test
App
App Server
Language
Libraries
OS Kernel
amazon
web services
boxfuse


git
artifactory
Build
Test
Machine Image
Machine Image
amazon web services
boxfuse

Machine Image

Machine Image

Machine Image

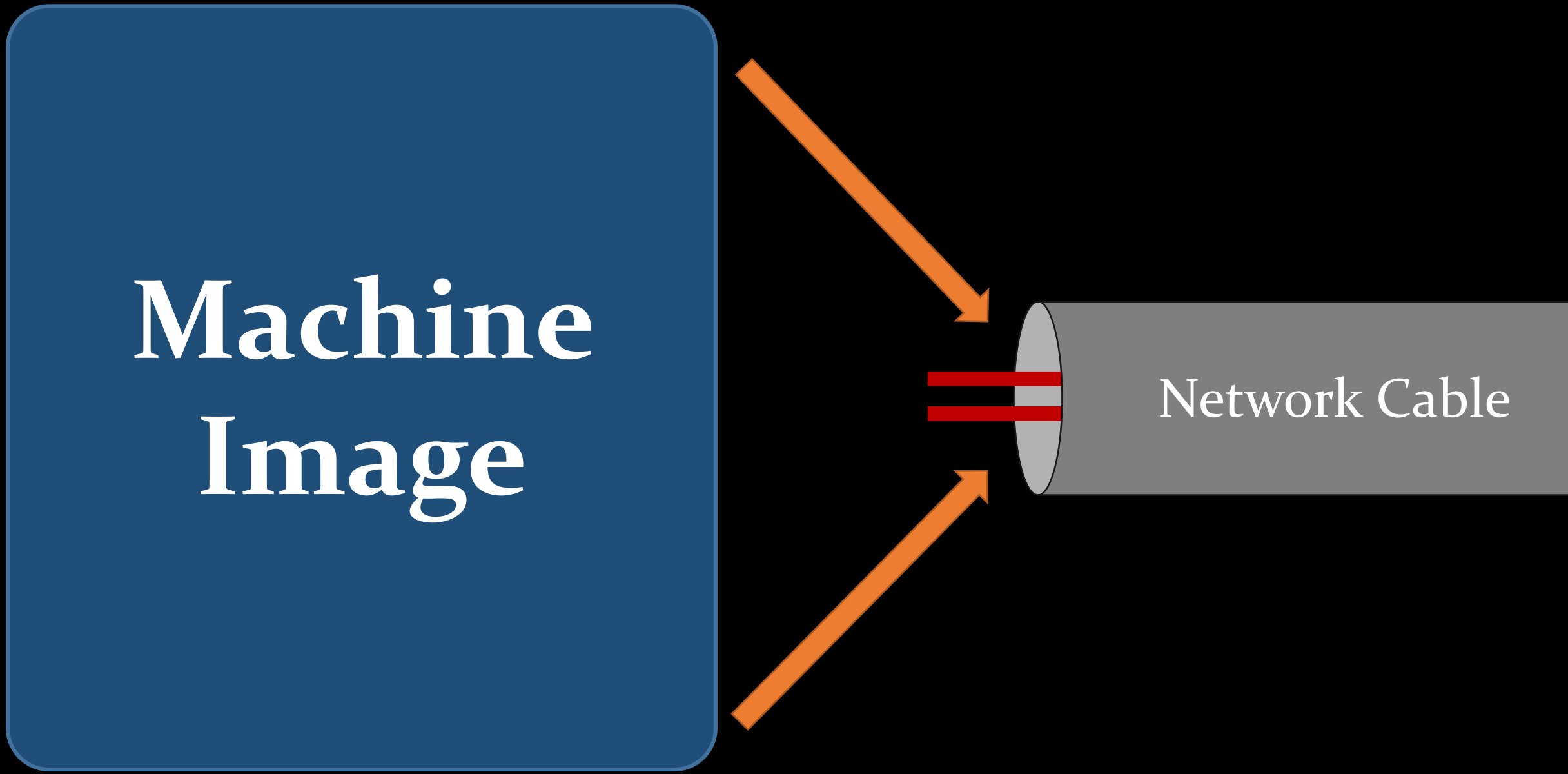
~~Updates~~

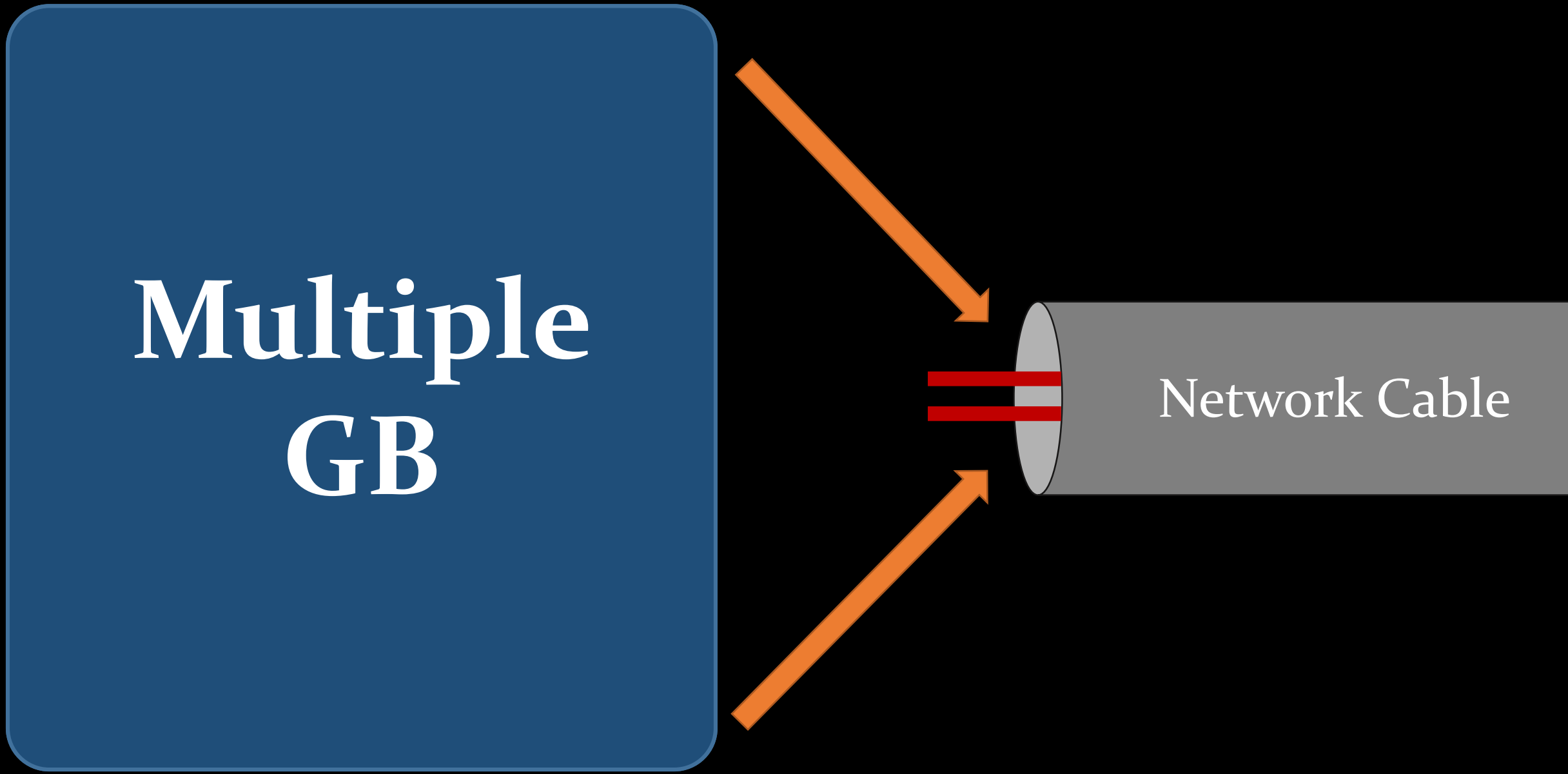
Machine Image

Machine Image

Machine Image

but there is one big problem left …


Machine Image
Network Cable



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Running servers in production should be like going backpacking. You take the bare minimum with you. Anything else is going to hurt.

A Wise Man

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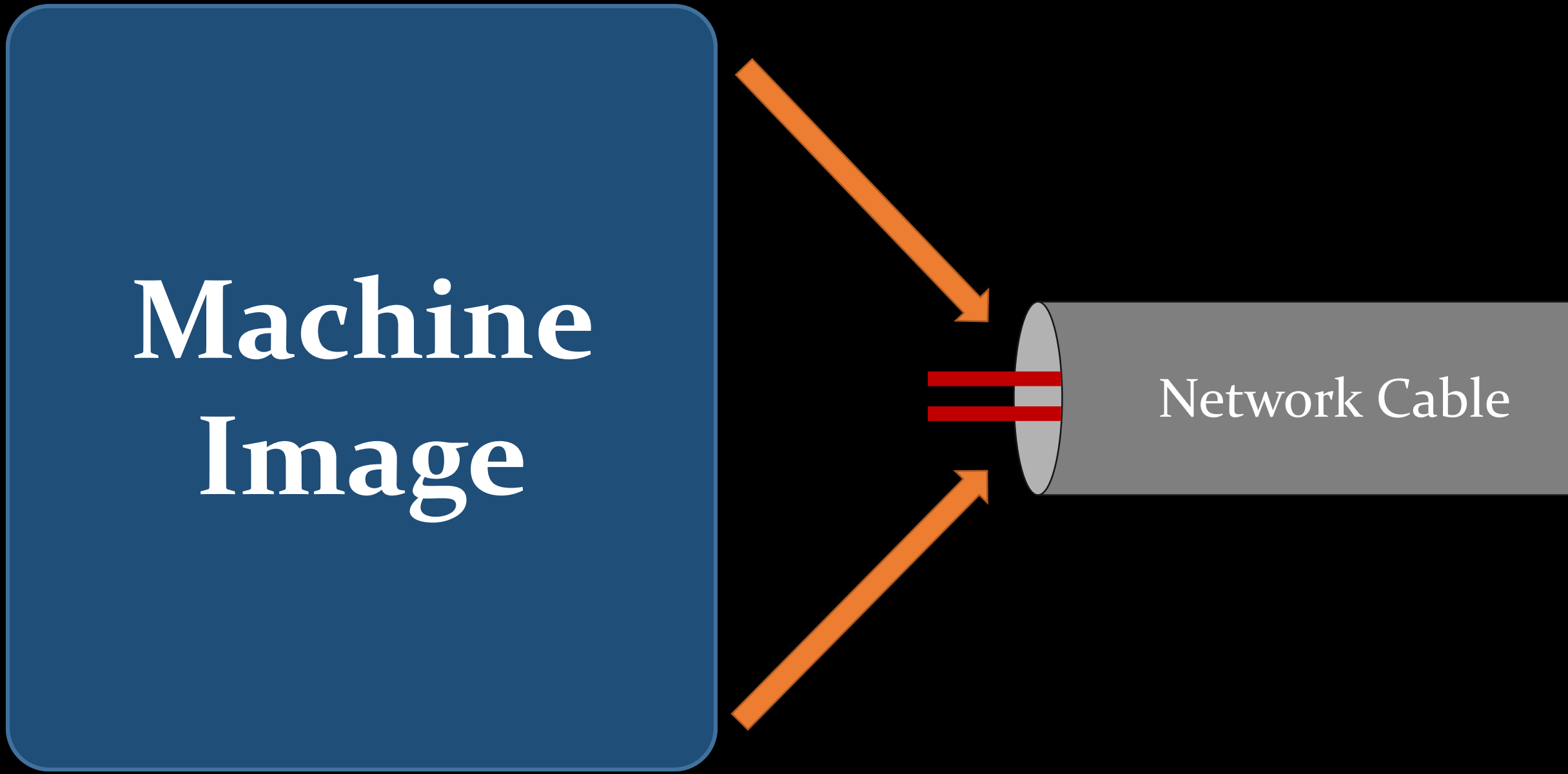
what is really adding business value ???



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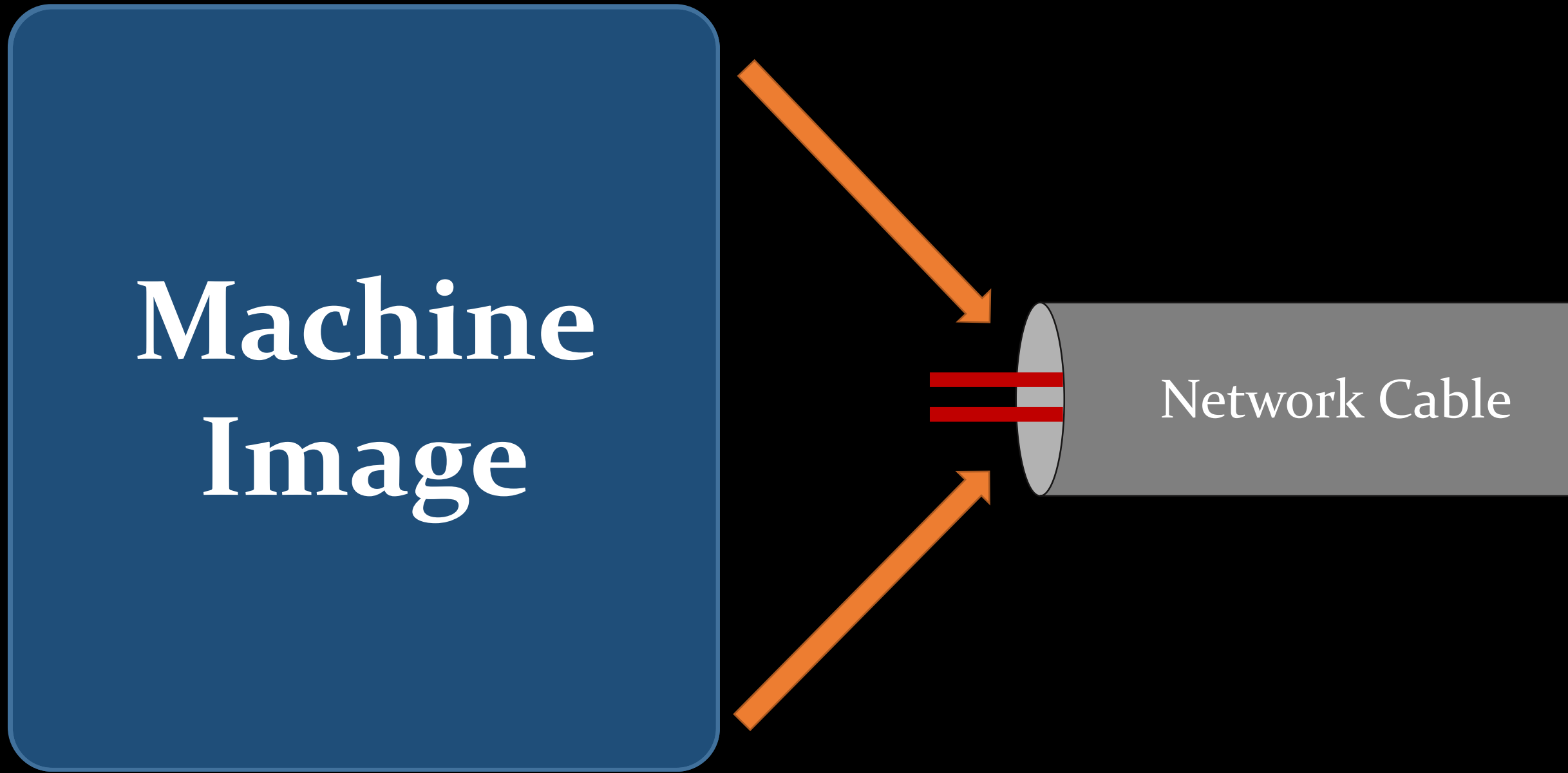
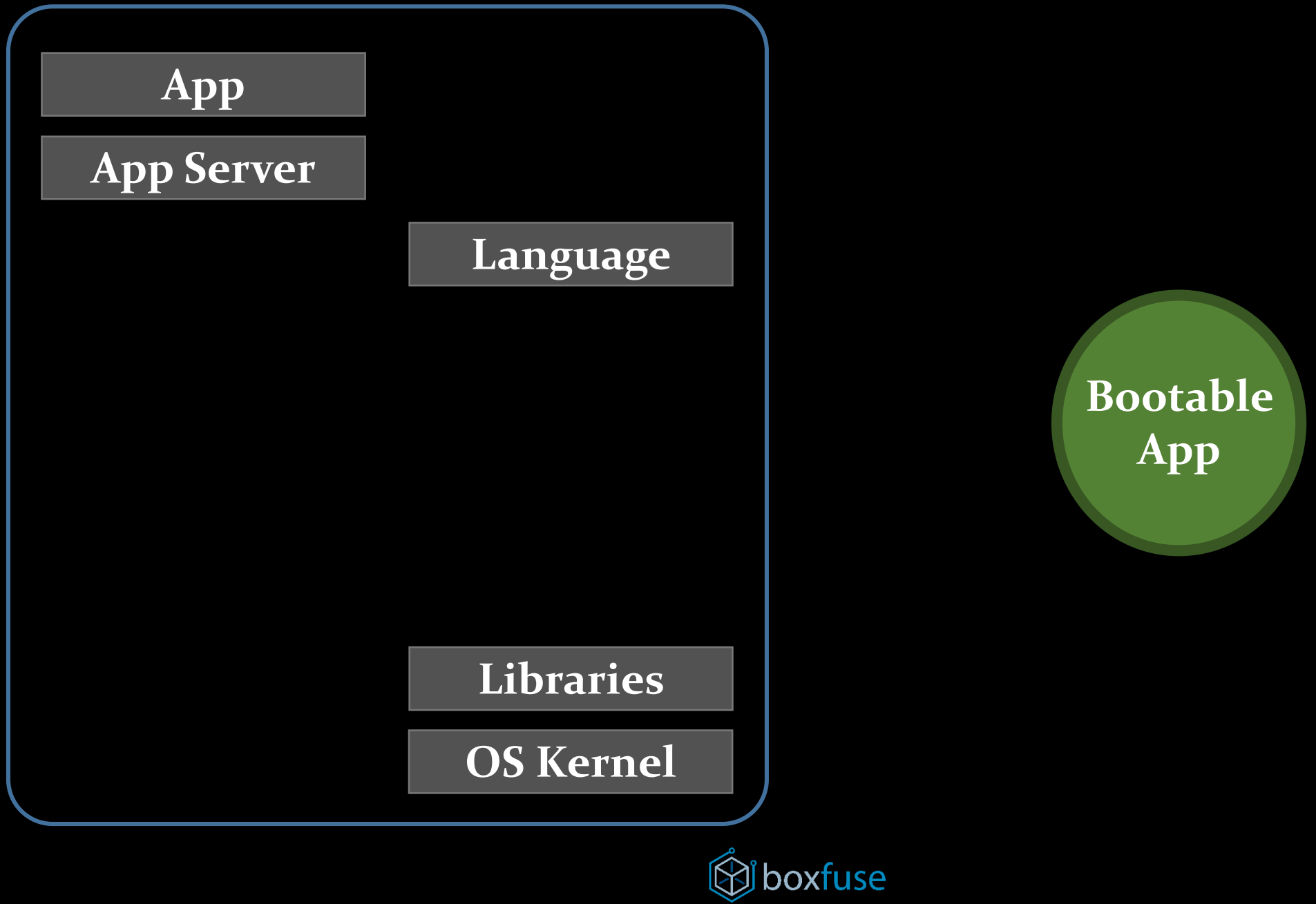
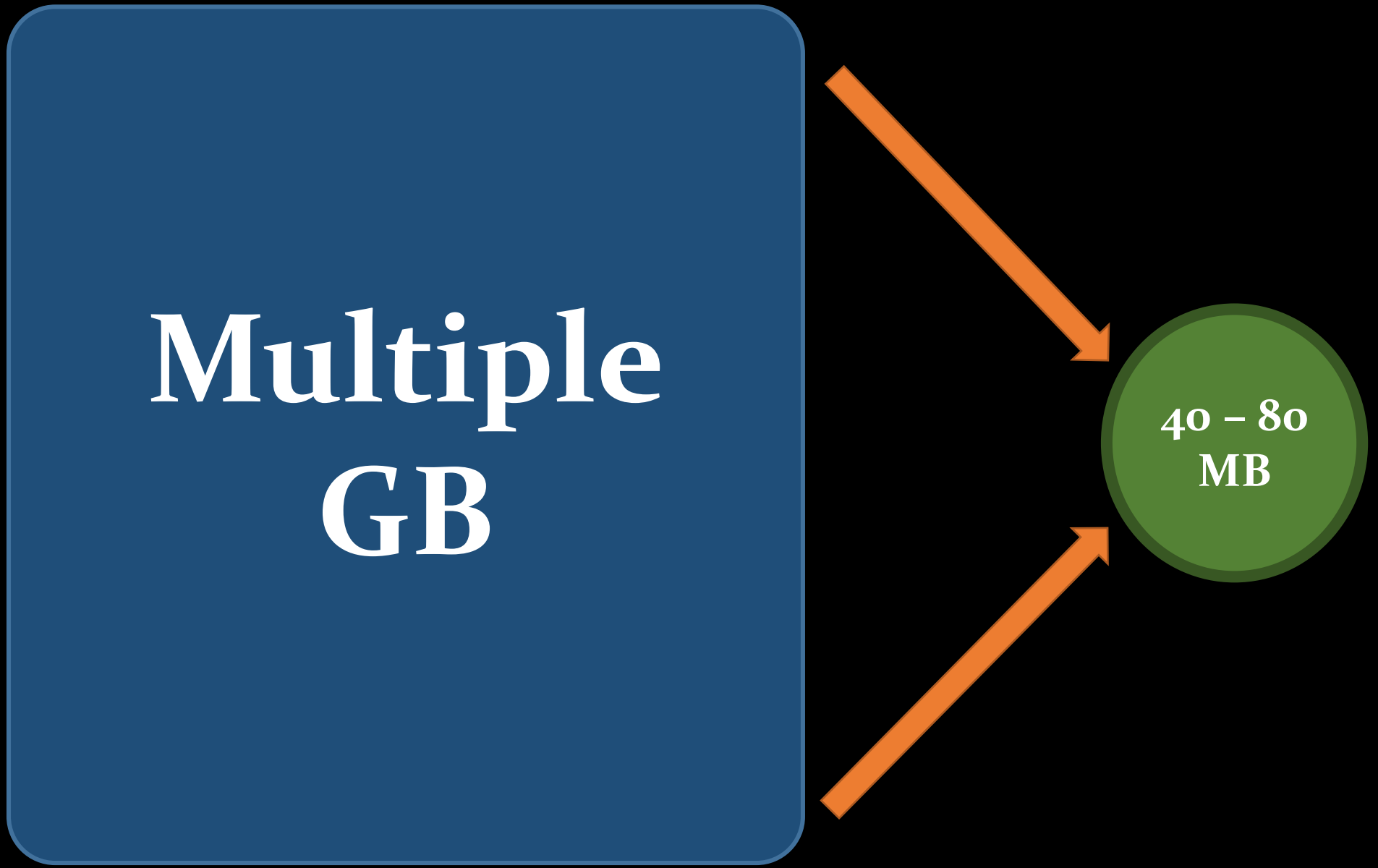


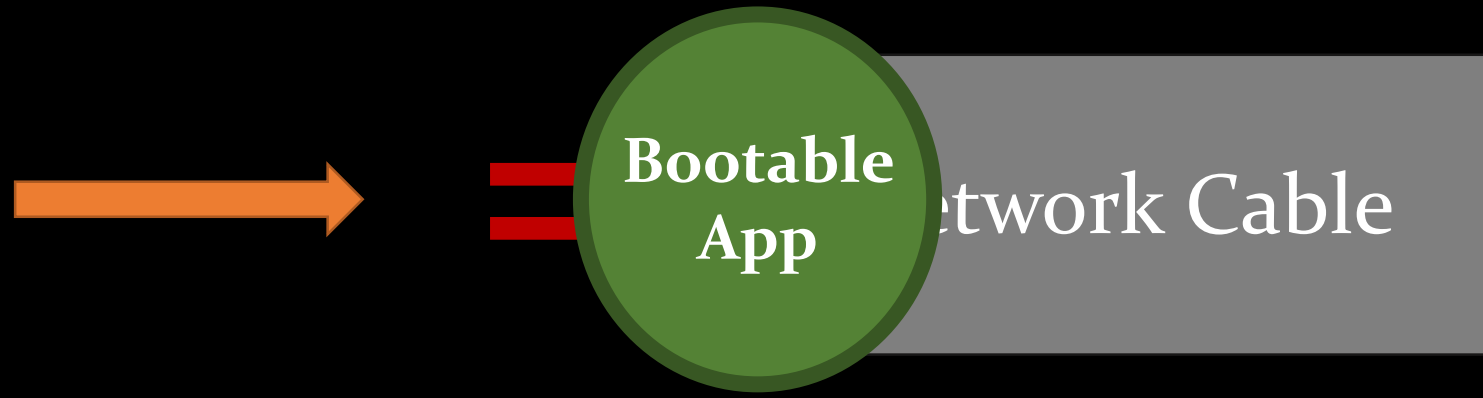
boxfuse


App
App Server
Language
Libraries
OS Kernel
Bootable App
boxfuse

40 – 80 MB



boxfuse



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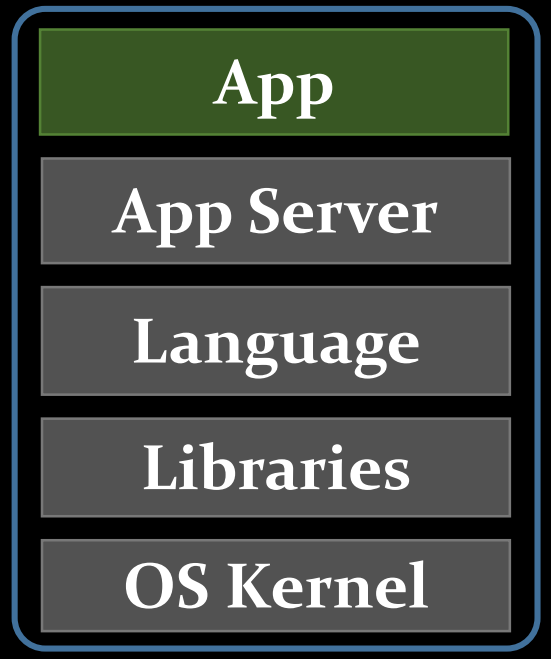
who is this for ???



12-factor app

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demo

What are the implications ???

Focus shift

Instance Service

Individual instances become disposable

Treat servers like cattle instead of pets

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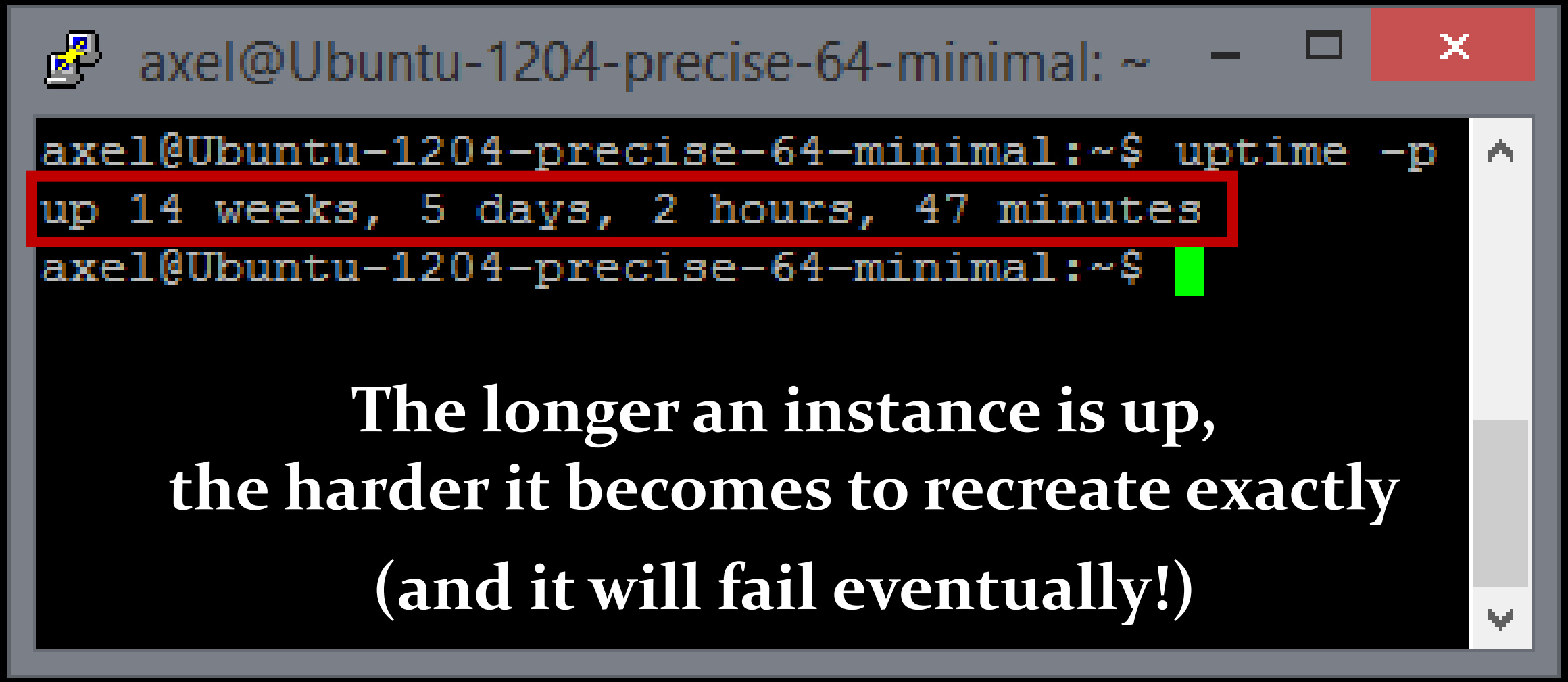
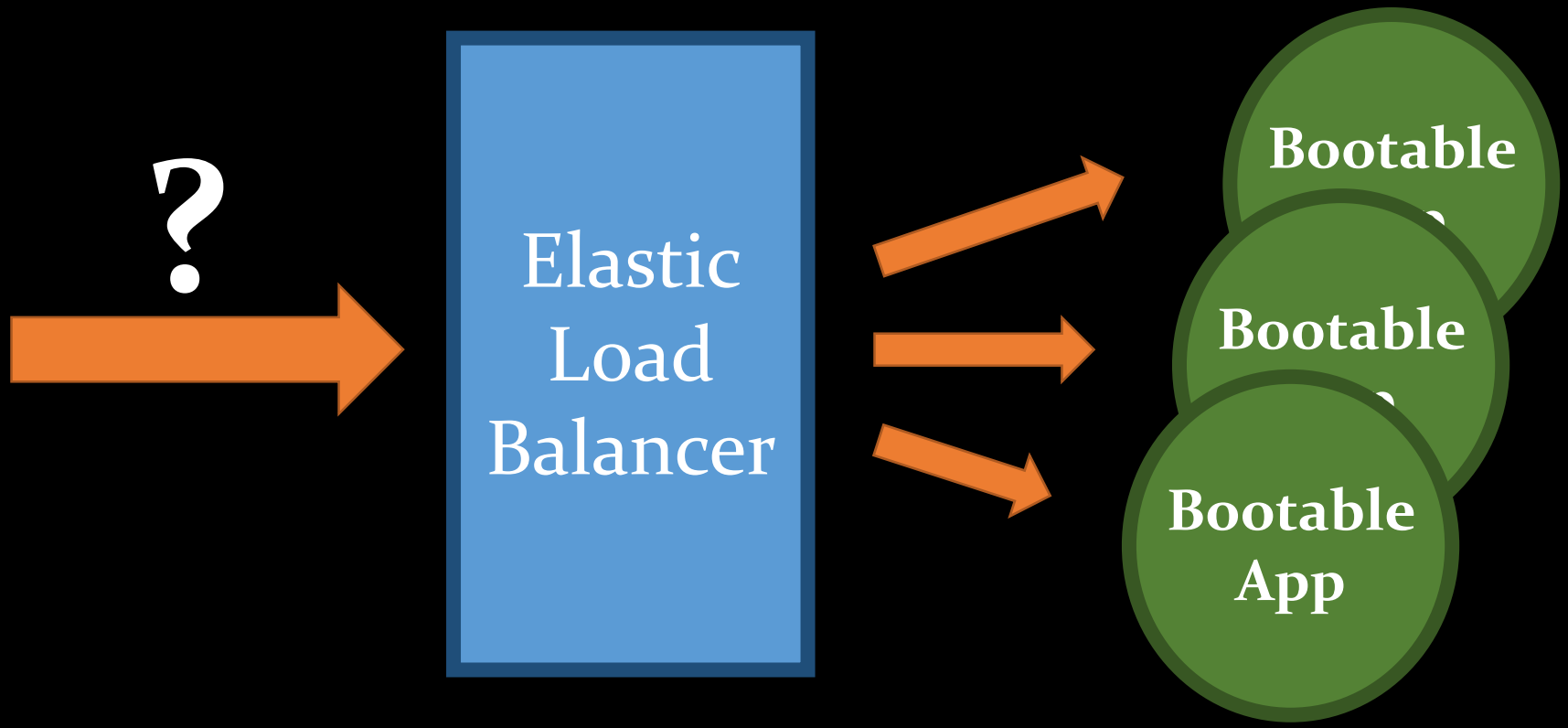
high uptime is a liability



How to solve service discovery ?



Use a stable entry point with an internal registry

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What about security ?

When was the last time your toaster got hacked?

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What about security ?

- Smallest possible attack surface
- Vastly reduced implications due to low uptime and transient nature of instances
- Very difficult to exploit other systems because essential tooling is missing

what about configuration ???

- Bake as much configuration as possible for all environments directly in the Bootable App

Key	Value
JDBC_URL	jdbc:...
ENV	prod

- Use environment detection and auto-configuration

- Pass remaining configuration at startup and expose it as environment variables

amazon web services

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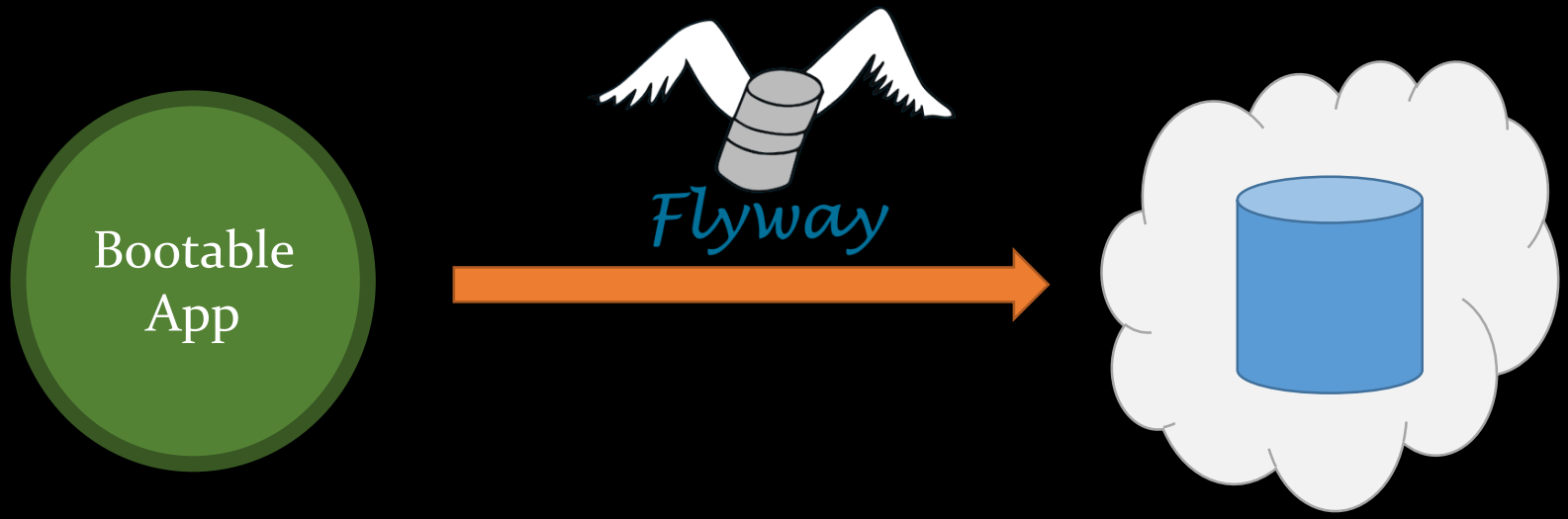
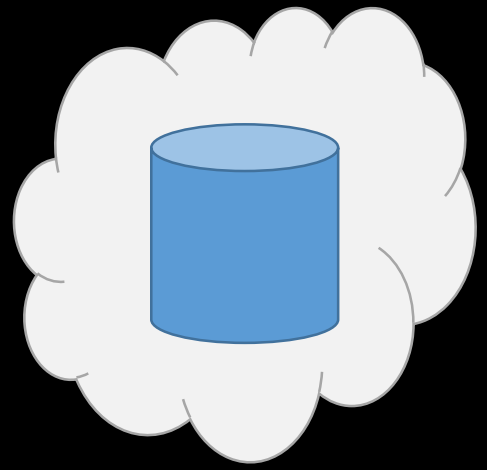
what about the database ???

what about the database ???



what about the database ???

- Keep all persistent state, including the database, out of the instance
- Many good hosted solutions available like Amazon RDS or Google Cloud SQL
- Use a database migration tool like Flyway to update on application startup



Much more about this in this room at 10:30 for
Flyway: Database Migrations made Easy

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what about the logs ???

Ship logs to a central log server

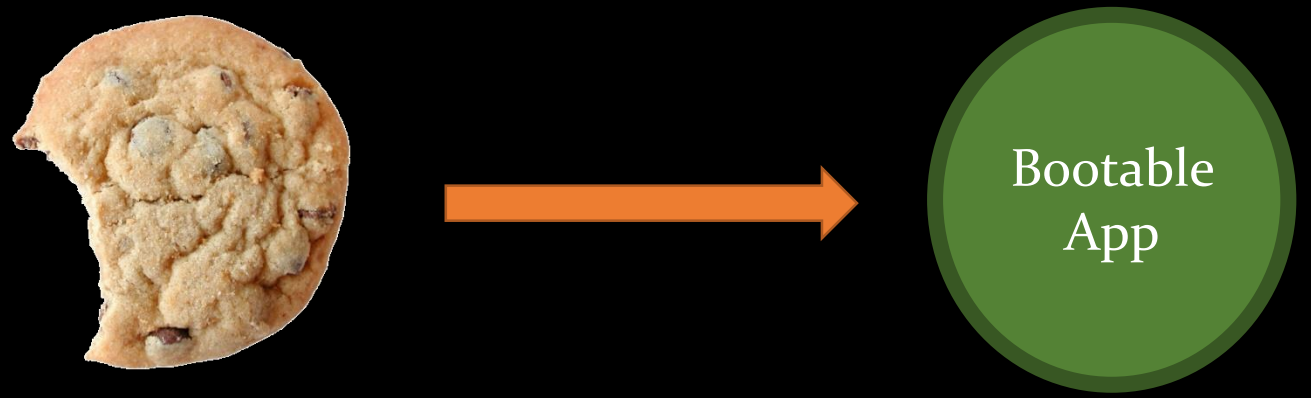
where they can be

- aggregated
- stored and backuped
- indexed
- searched through a nice web UI

Many good hosted solutions

- Loggly
- Logentries
- Papertrail
- ...

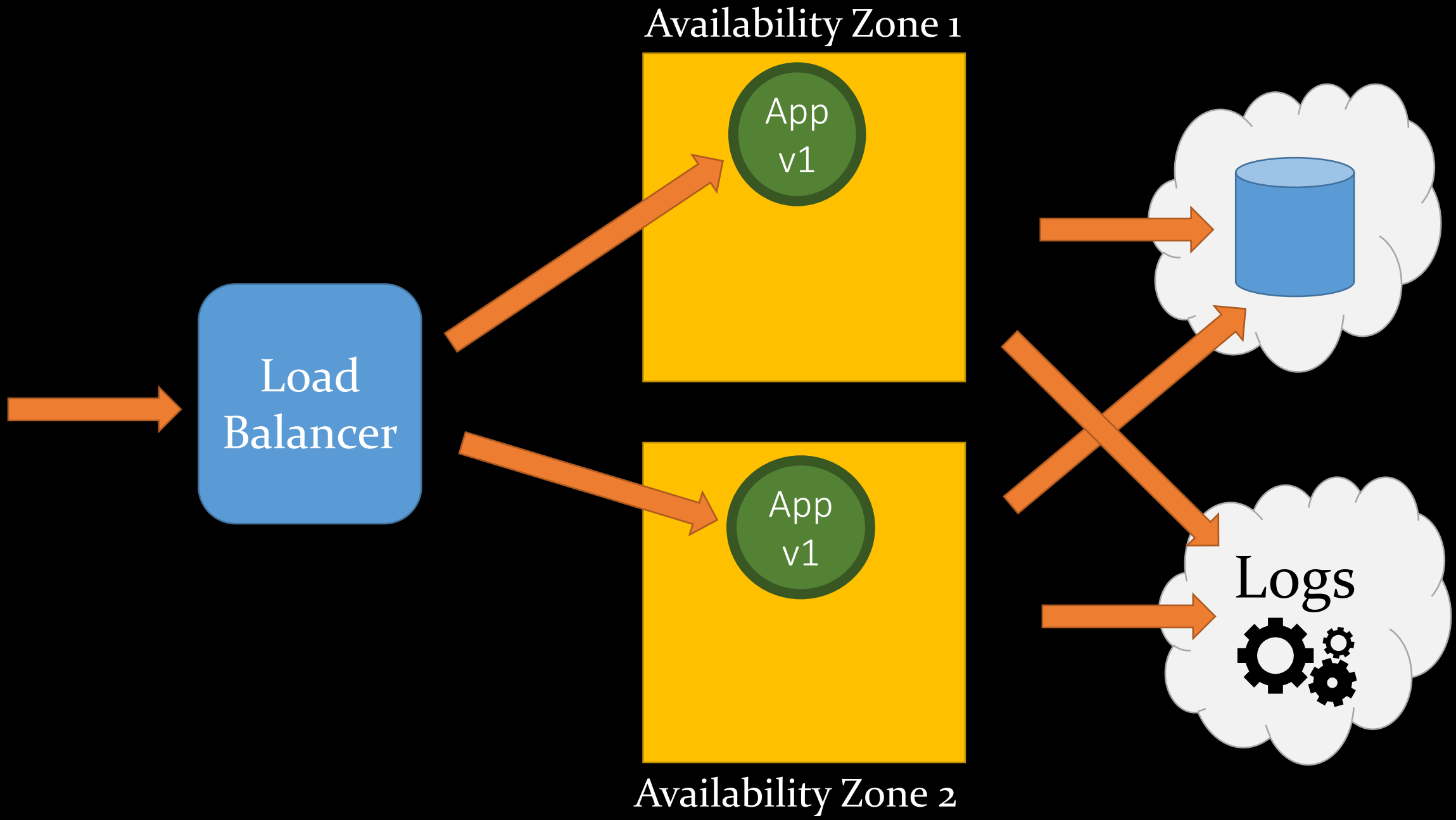
what about sessions ???

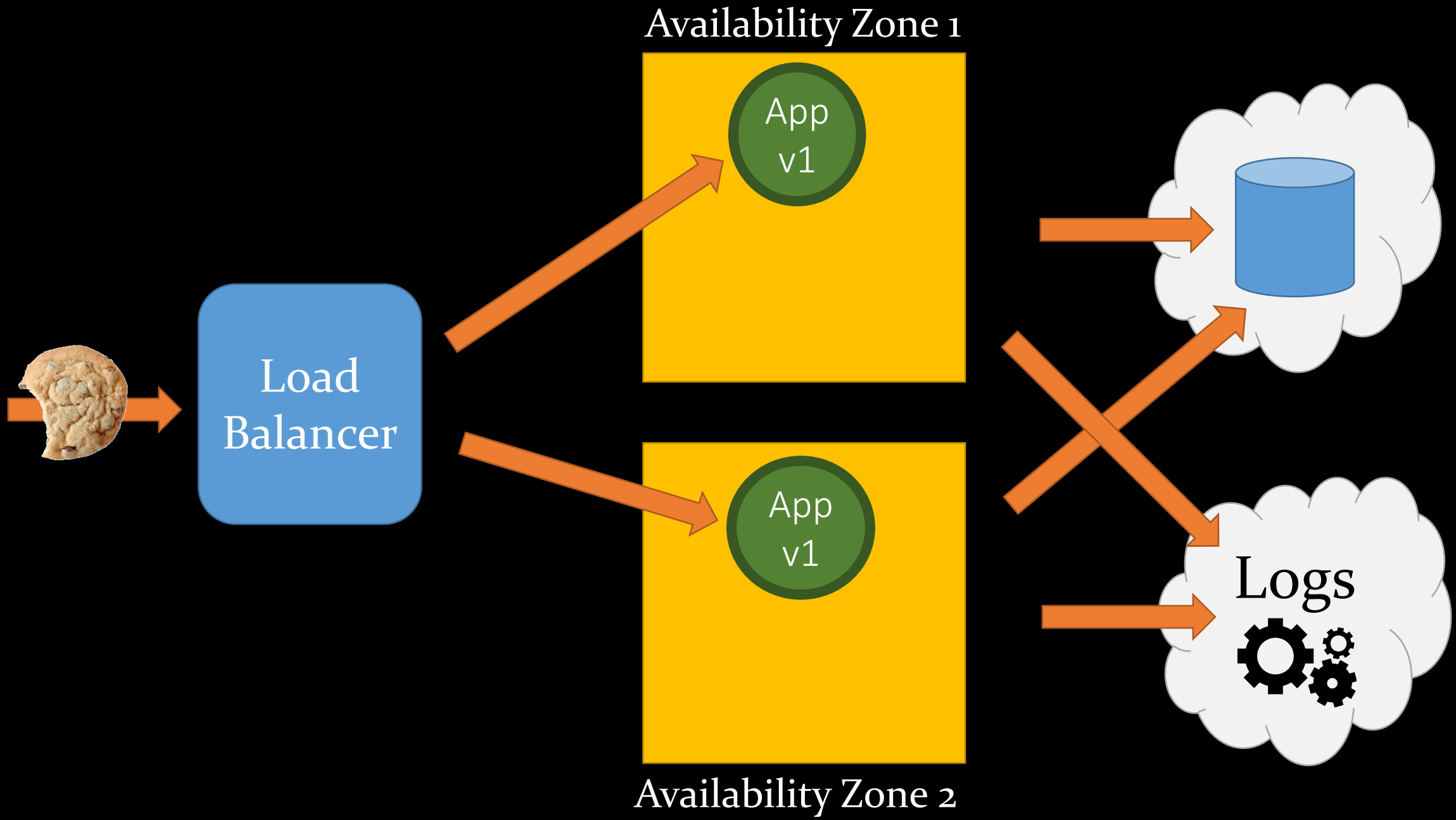


Keep session in an encrypted and signed cookie

- avoids session timeouts
- avoids server clustering & session replication
- avoids sticky sessions & server affinity

what about rolling out new versions ???


Availability Zone 1
App
v1
Load
Balancer
App
v1
Logs
Availability Zone 2
boxfuse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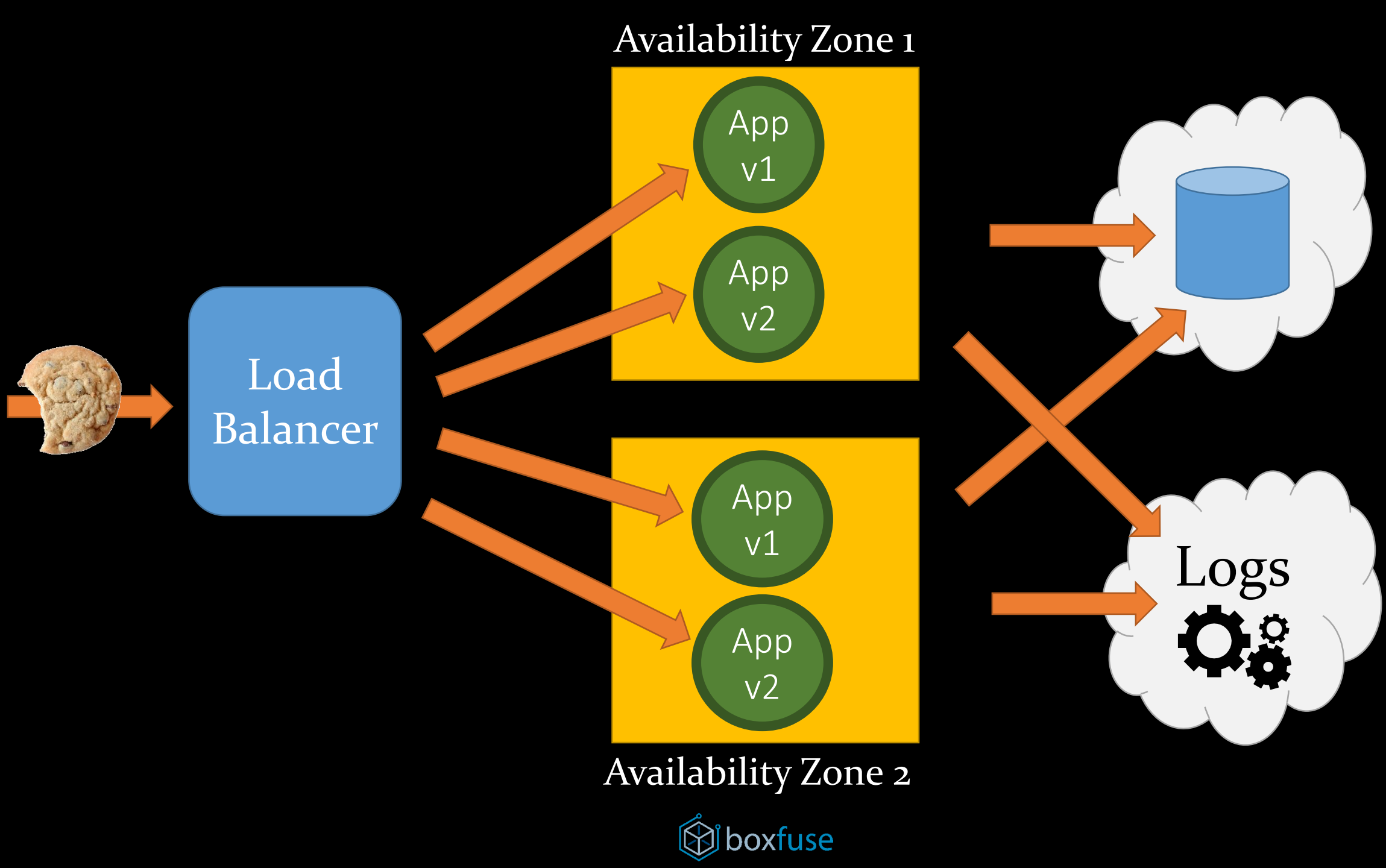
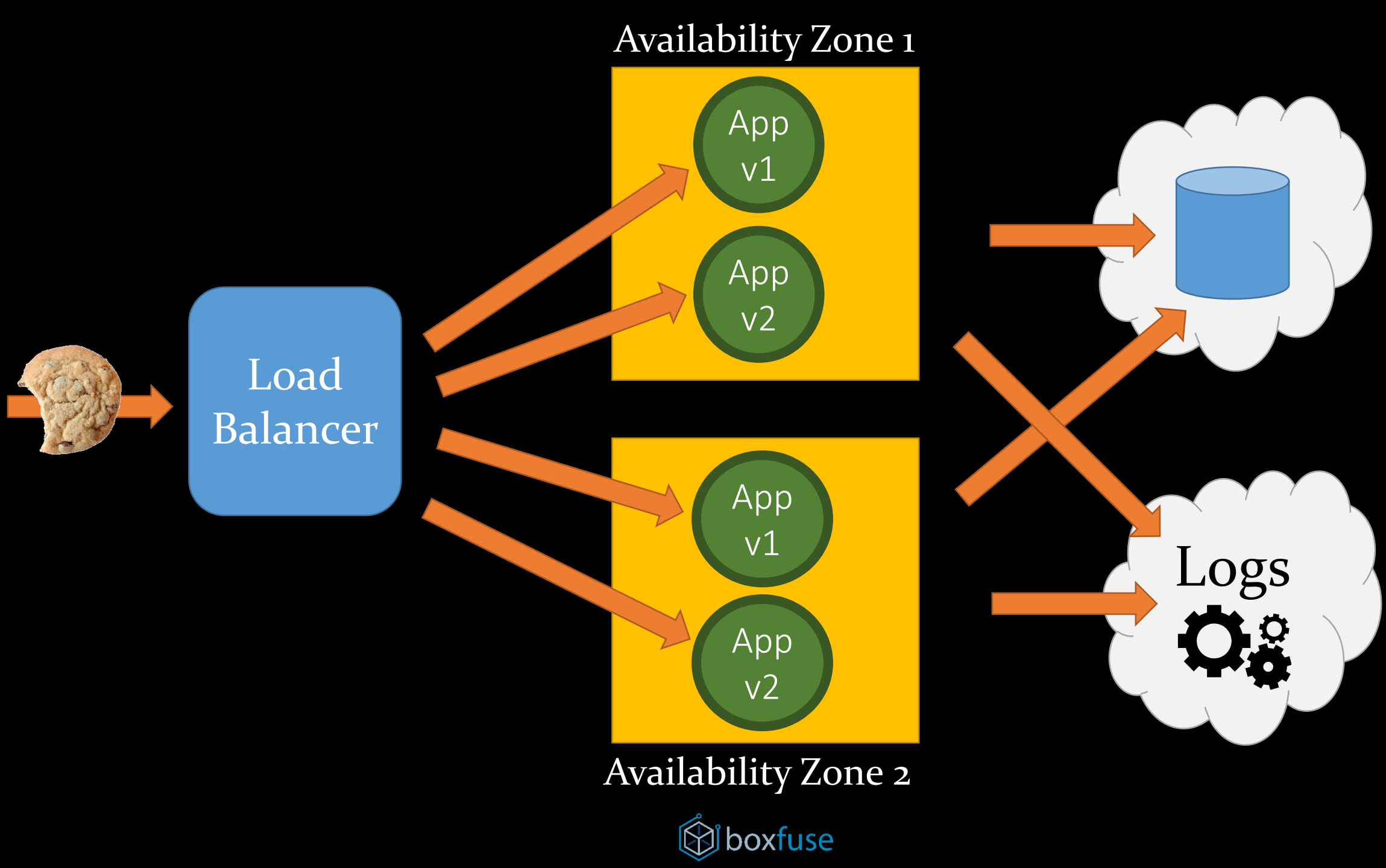

Availability Zone 1
App v1
App v2
Load Balancer
App v1
App v2
Logs
Availability Zone 2
boxfuse


Availability Zone 1
App v1
App v2
Load Balancer
App v1
App v2
Logs
Availability Zone 2
boxfuse

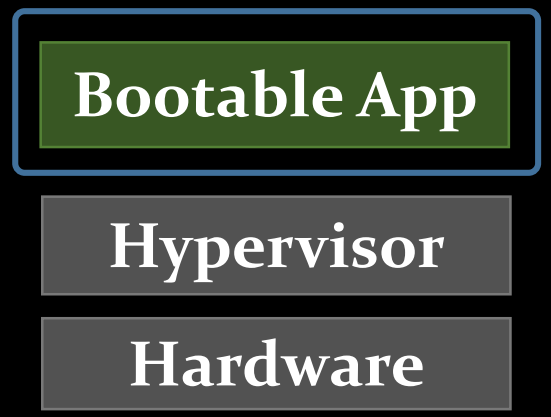
what about containers ???

understanding modern CPUs

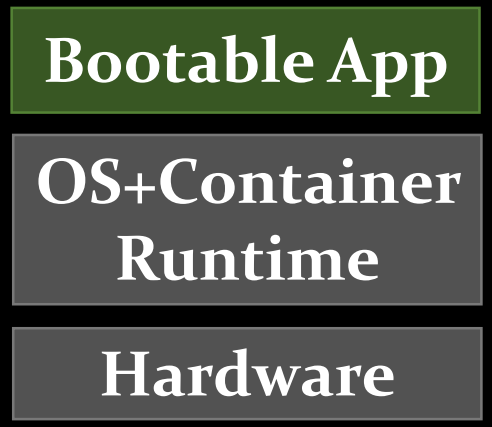
Both Intel and AMD have hardware support for virtualization

- isolation
- performance

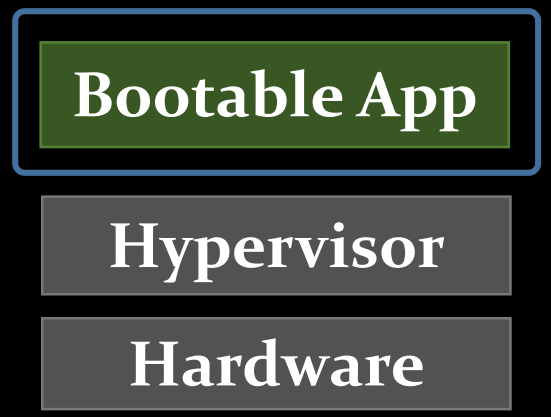
Remember our Edison Screw?



On Prem

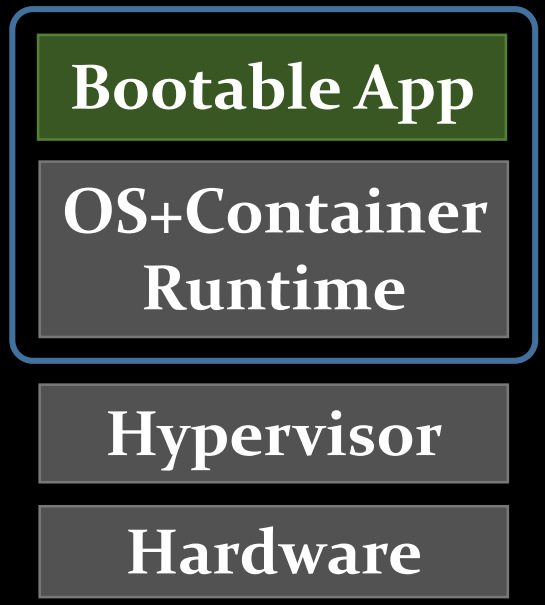


On Prem



On Prem / Cloud

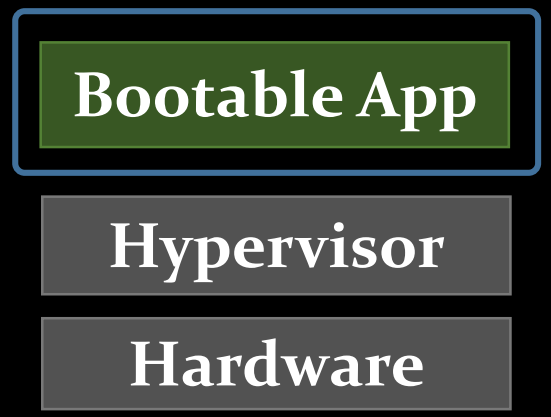
On Prem



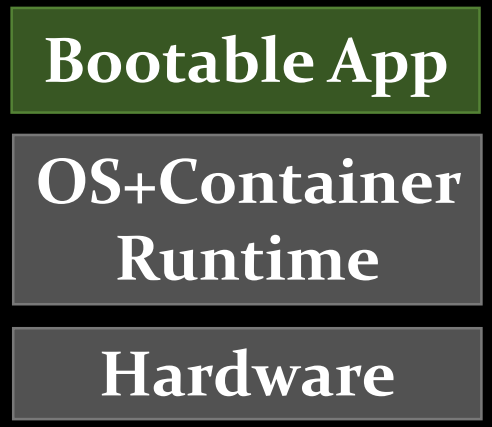
Cloud

Only makes sense if you cannot afford $9.60/month granularity

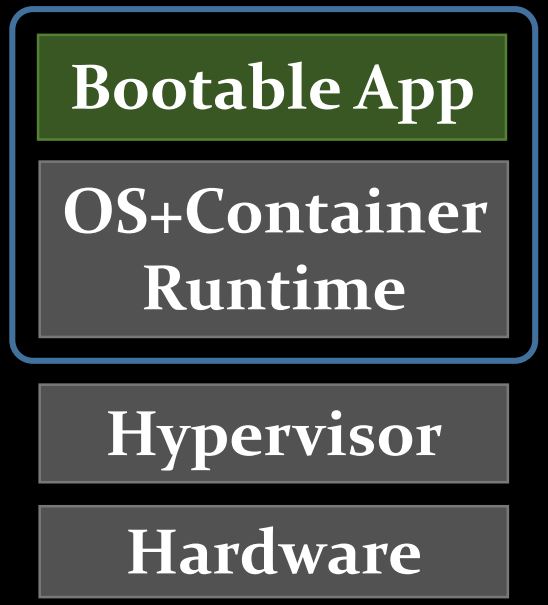
boxfuse



On Prem / Cloud



On Prem



Cloud

Only makes sense if you cannot afford 1.3 cents /hour granularity

boxfuse

summary

- One immutable unit
- Regenerated after every change
- Promoted from Environment to Environment

Classic Mistake: Build per Environment

- One immutable unit
- Regenerated after every change
- Promoted from Environment to Environment

Classic Mistake: Build per Environment

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AXEL FONTAINE
@axelfontaine

Thanks !

See you tomorrow in this room at 10:30 for
Flyway: Database Migrations made Easy

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