SPRINGONE2GX
WASHINGTON, DC

12 Factor (Cloud Native) Apps for Spring Developers

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Cloud Native Applications

“developed specifically for cloud platforms”	what’s a cloud platform?
highly scalable	seems right
mobile	not always, but okay
agile	definitely
run in containers	implementation detail
microservices	probably
designed for failure	without question

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THE TWELVE-FACTOR APP

http://12factor.net/

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Factor 1 – Codebase

One codebase tracked in revision control, many deploys

1 Codebase = 1 App

Maybe?

Let’s look at some alternatives:

1 Codebase = * Apps

* Codebase = 1 App

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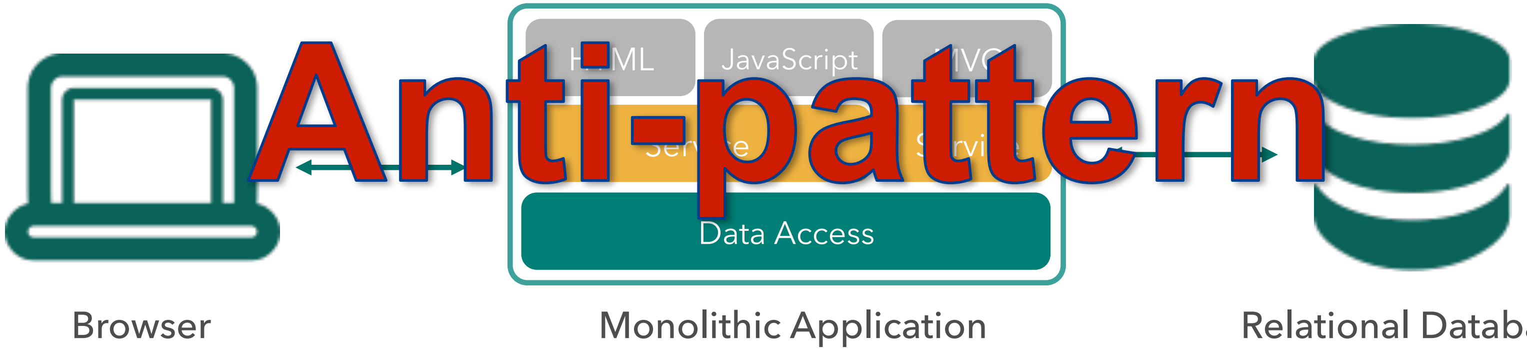
1 Codebase = * Apps

Or, 1 Codebase = what should be * Apps



… But is something we can migrate from

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Migrating the Monolith

Prerequisites

- Adequate test coverage
- Pipelines
- Sane build environment

Choose a business function

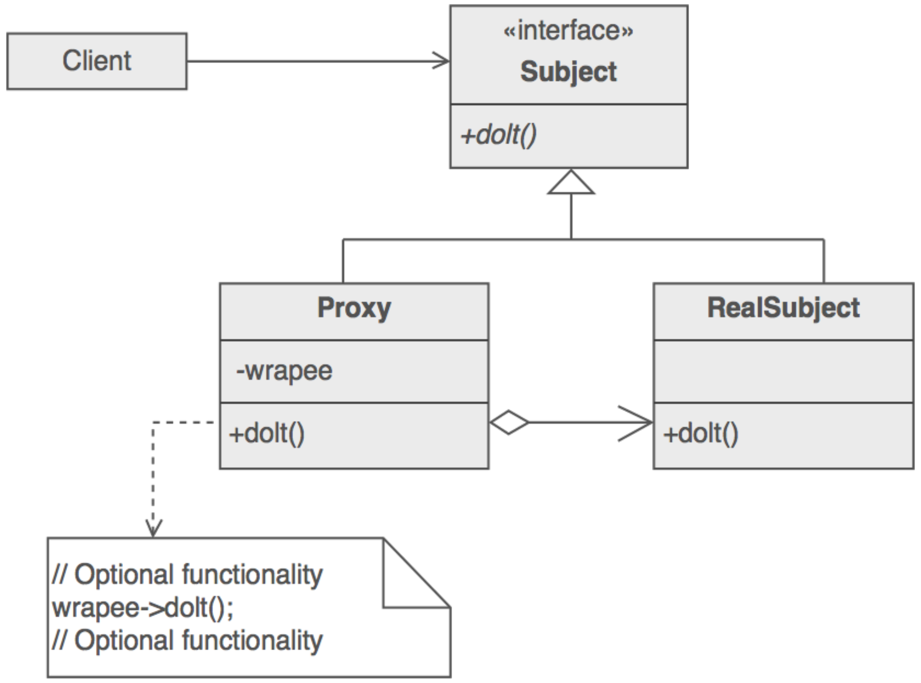
- Simple & bounded
- Value in extraction

Extract it

- New repo & implement service
- Use spring boot

Connect it

- Connect to existing app via proxy



http://blog.pivotal.io/pivotal-cloud-foundry/case-studies/case-study-refactoring-a-monolith-into-a-cloud-native-app-part-1

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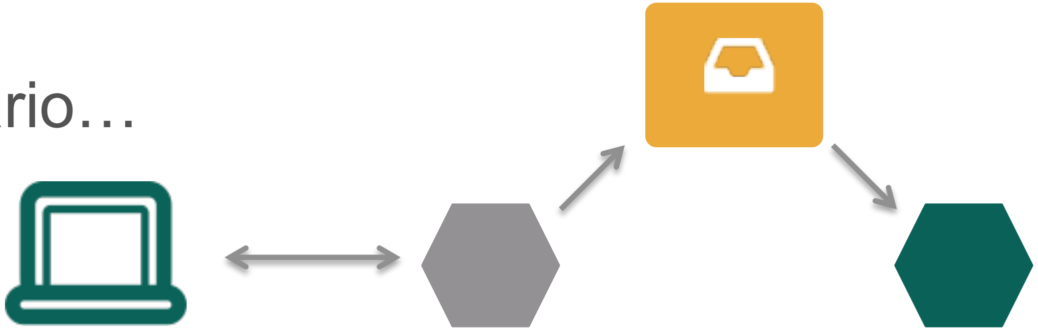
* Codebase = 1 App?

For clarification: 1 Codebase = 1 Process

Let’s look at a scenario…



Suspend disbelief for a moment…

… but 2 codebases means (possibly) 2 teams

… and 2 teams necessitates APIs!!!!!

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Factor 1 – Codebase

One codebase tracked in revision control, many deploys

1 Codebase = 1 App

?

Probably

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Factor 15 – API First

How your microservices will communicate

Bonus Factor!!

Design

Develop

Version

Discover

http://www.api-first.com/

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Factor 2 – Dependencies

Explicitly Declare and Isolate dependencies

Goal: Developer to avoid dependency hell

+ Repeatable deployments

While I know this is a developer conference…

… your apps will

(hopefully)

be operated

(by you)

in production

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Let’s take a little detour for a moment…

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Factor 5 – Design, Build, Release, Run

Strictly Separate Stages

Stage	Who?	What?	Why not n & n+1?
Design	Dev	Spring/Spring Boot, Gradle, Maven	Developer best understands the dependencies
Build	CI	.war or .jar	One build, many deploys Anti – "it works on my machine"
Release	Platform	Droplet, Docker Image	Agile deployments, Upgrades, Rollbacks
Run	Platform	Container + process	Speed

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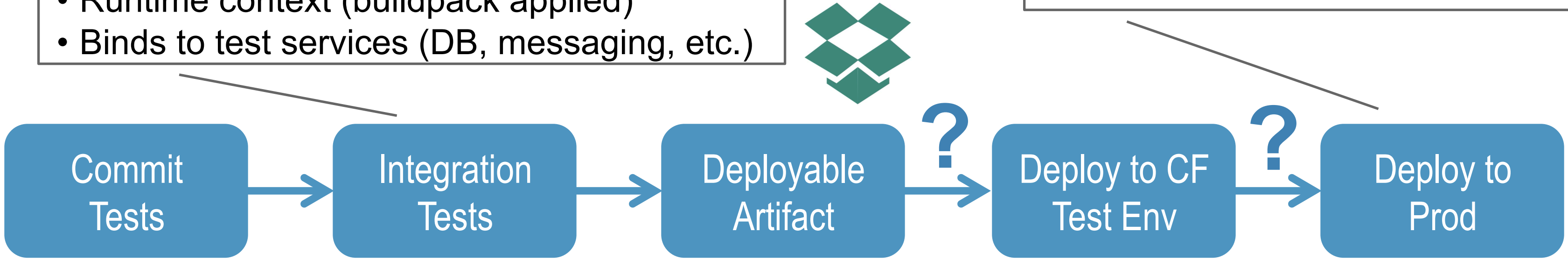
The Deployment Pipeline



(after commit)
- Developer or QA crafted
- CI executed
- Runtime context (buildpack applied)
- Binds to test services (DB, messaging, etc.)

- “cf push”
- Runtime context (buildpack applied)
- Binds to prod services (DB, messaging, etc.)
- Periodic smoke tests
- Monitoring

- Developer crafted (before impl.)
- Stubs/mocks external services
- Developer executed (before commit)
- CI executed (after commit)

- “cf push”
- Runtime context (buildpack applied)
- Binds to test services (DB, messaging, etc.)
- Periodic smoke tests

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Now, coming back to **Dependencies**…

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Remember, its about

Repeatable Deployments

so **nothing** about the runtime environment should be assumed.

Explicitly declare dependencies!

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Is the runtime provided by the

Developer

or the

Platform?

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Let’s look at some

CODE

(finally)

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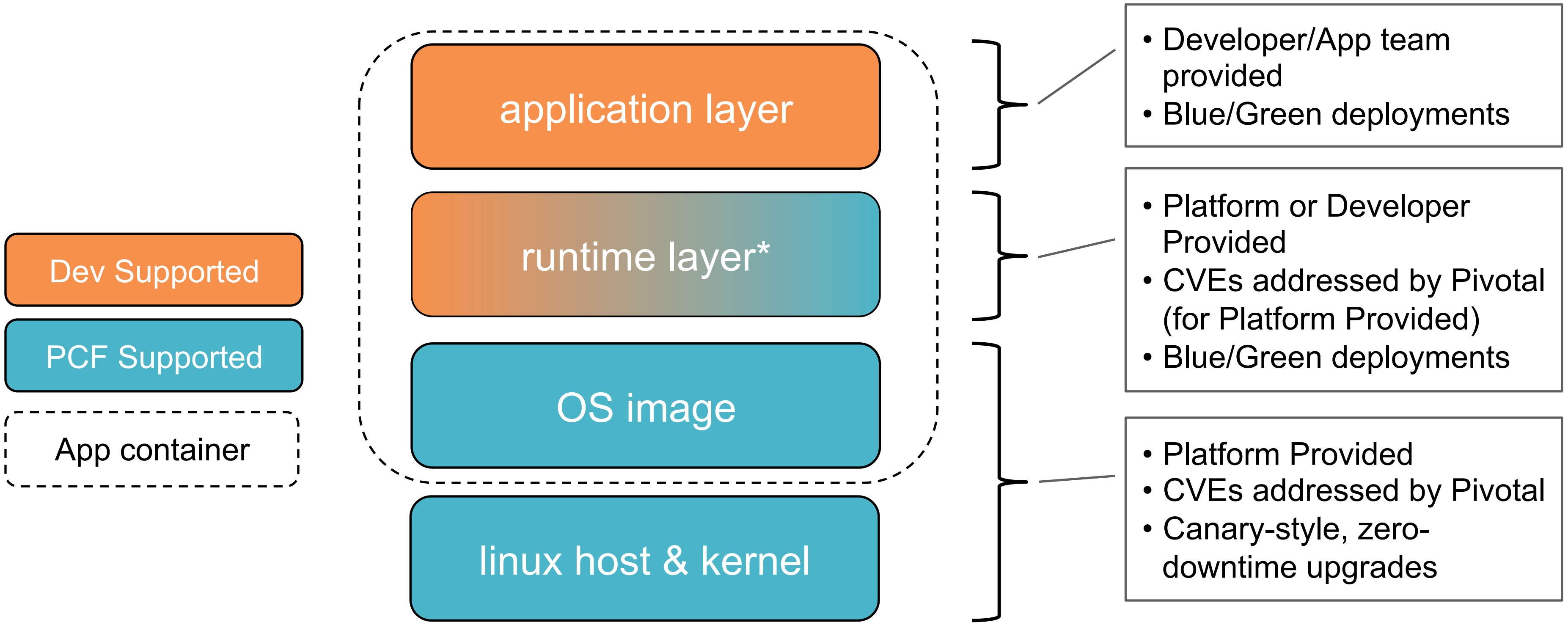
PCF – Each Layer Upgradable with Zero Downtime



- Developer/App team provided
- Blue/Green deployments

- Platform or Developer Provided
- CVEs addressed by Pivotal (for Platform Provided)
- Blue/Green deployments

- Platform Provided
- CVEs addressed by Pivotal
- Canary-style, zero-downtime upgrades

* How much provided by dev and how much by platform?

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Spring Boot – embedded runtime

```
...
apply plugin: 'java’
apply plugin: 'spring-boot’
...
jar {
    baseName = 'twelvefactor'
    version =  '0.1.0'
}
...
dependencies {
  compile("org.springframework.boot:spring-boot-starter-web") {
        exclude module: "spring-boot-starter-tomcat"
  }
  compile("org.springframework.boot:spring-boot-starter-jetty")
...
```

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Spring Boot – external runtime

```
...
//apply plugin: 'spring-boot’     ← Omit as it brings embedded Tomcat
apply plugin: 'war'
apply plugin: 'io.spring.dependency-management'

war {
    baseName = 'twelvefactor'
    version =  '0.1.0'
}
...
dependencies {
  compile("org.springframework.boot:spring-boot-starter-web")
  providedRuntime("org.springframework.boot:spring-boot-starter-tomcat")
...
```

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Factor 3 – Config

Store the Config in the Environment

What is Configuration?

- Resource handles to databases and other backing services
- Credentials to external sources (e.g. S3, Twitter, ...)
- Per-deploy values (e.g. canonical hostname for deploy)
- ANYTHING that's likely to vary between deploys (dev, test, stage, prod)

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Factor 3 – Config

Store the Config in the Environment

Where NOT to store it:

- In the CODE (Captain Obvious)
- In PROPERTIES FILES (That's code...)
- In the BUILD (ONE build, MANY deploys)
- In the APP SERVER (e.g. JNDI datasources)

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Store it in the

Environment

Let’s have a look…

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Spring – Picking up Env Vars

```
...
import org.springframework.context.EnvironmentAware;
import org.springframework.core.env.Environment;

@RestController
public class HelloController implements EnvironmentAware {

      private String name;

      @Override
      public void setEnvironment(Environment environment) {
            this.name = environment.getProperty("who");
      }
...
```

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Factor 11 – Logs

Treat Logs as Event Streams

Log to stdout and stderr!

the standard implemented by the platform

Let's have a look…

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Spring – Using ENV to config logging

In application.yml

```
logging:
  level:
    org.springframework: ${SPRING_LOG_LEVEL:INFO}
    hello: ${LOG_LEVEL:INFO}
```

BUT

Use this property file **ONLY** as an (hierarchical) abstraction!

Store config in the environment!!

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Factor 9 – Disposability:

Maximize robustness with fast startup and graceful shutdown

You **cannot**…

scale

deploy

release

recover

… **fast** if you cannot start fast!

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Factor 9 – Disposability:

Maximize robustness with fast startup and graceful shutdown

You **cannot start** if you did not shutdown gracefully!

Where did all my db **connections** go?

Why are all my jobs **locked**?

Uhh, that **job was** in progress?

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Factor 4 – Backing services

Treat Backing Services as Attached Resources

Access services through a URL, never locally!

Store the Locator in the config (see F3)

Resource locations can be changed according to the fancy of the operator

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Create an instance of a resource

```
                          service   plan   service name
cf create-service cleardb spark hellodb
```

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Attach the resource to our app

```
                                     app       service name
cf bind-service hello-app hellodb
```

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Attach the resource to our app

(declaratively)

```
---
applications:
- name: hello-spring-one
  memory: 1G
  path: build/libs/twelvefactor-0.1.0.jar
  random-route: true
  services:
   - hellodb   <- The name of the service we depend on!
```

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How do I consume that? (demo)

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Our code builds with knowledge of a config entry named `hellodb`

Every release has a config entry named `hellodb`

`hellodb` is fetched at runtime and provides URL & credentials for our resource

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Factor 10 – Dev/prod parity

Keep development, staging
And production as similar
as possible

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WHY?

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Cloud Native & 12 Factor apps are designed for continuous deployment

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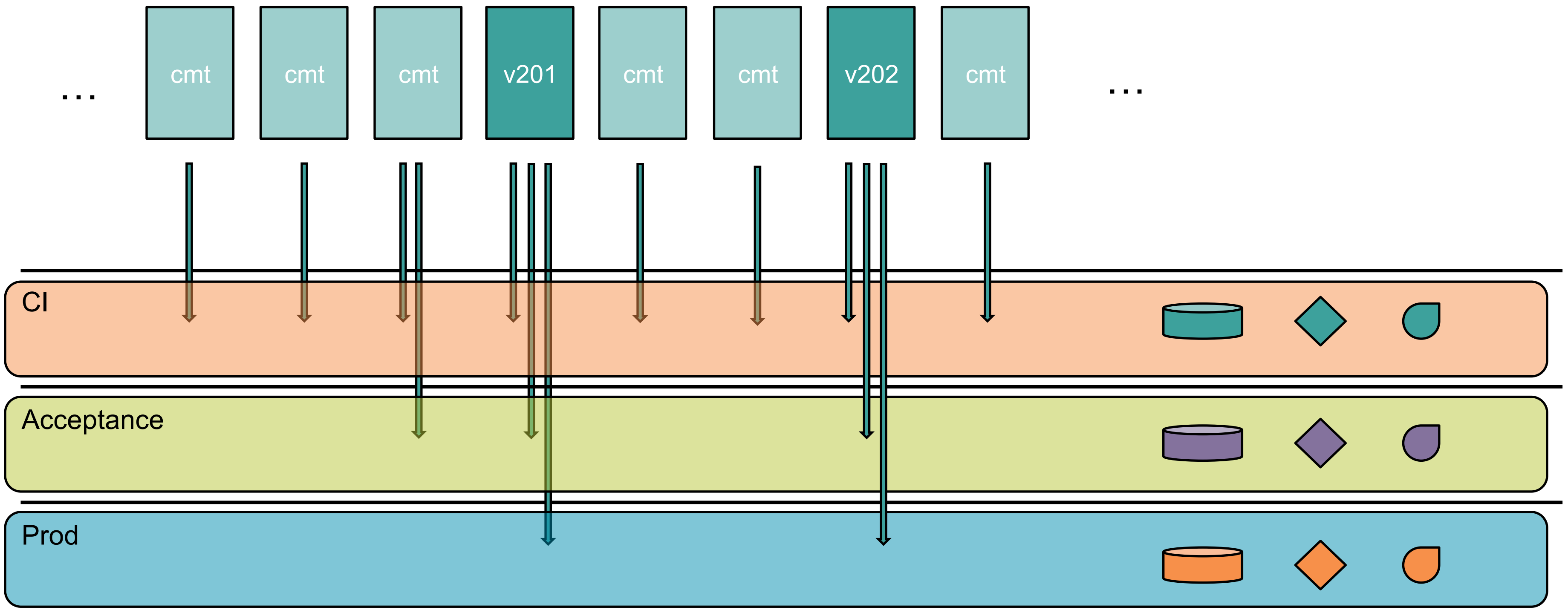
Environment Parity Enables Speed



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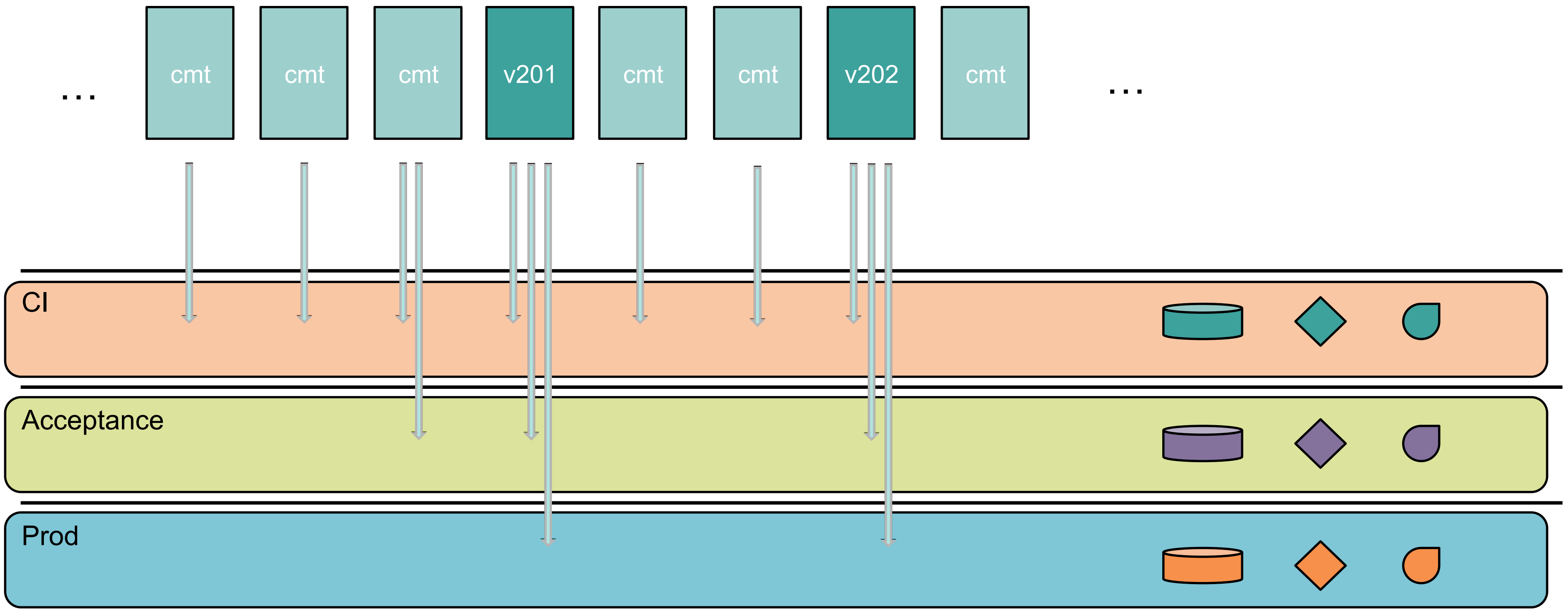
Every Commit is a Candidate for Deployment



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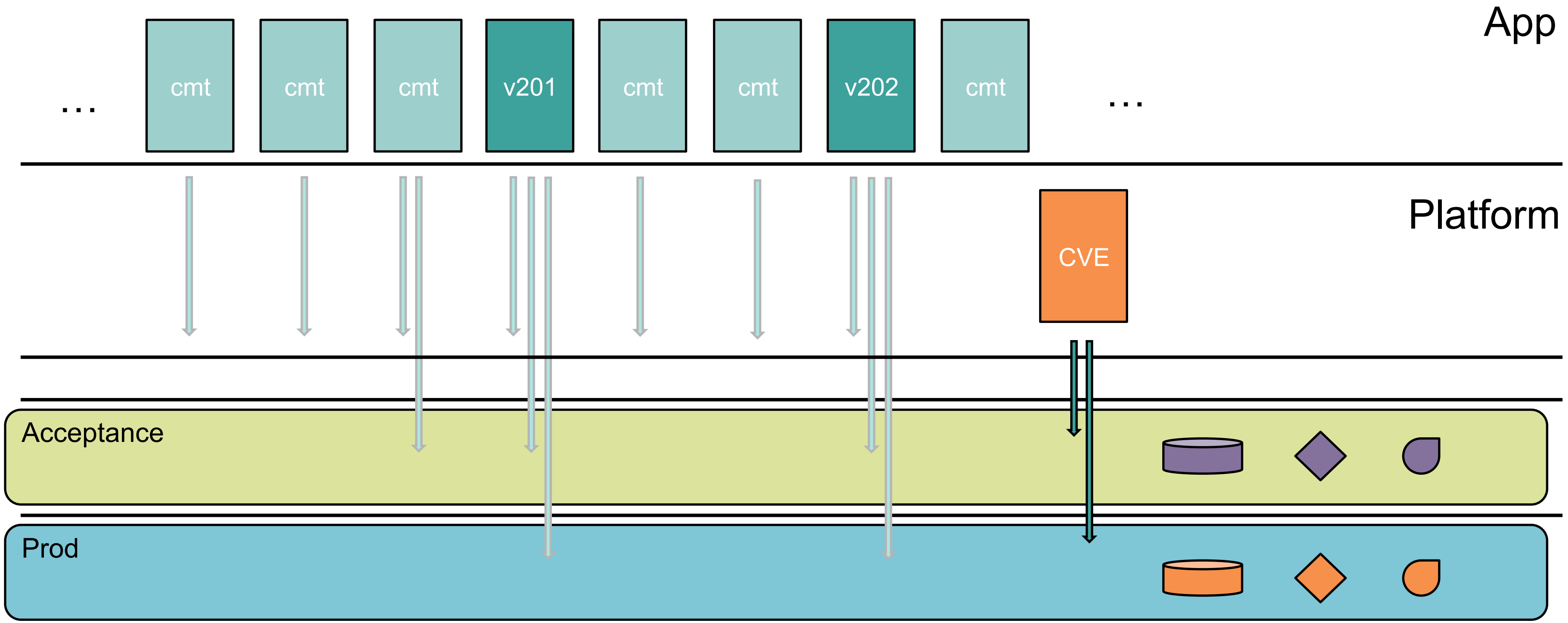
Every Commit is a Candidate for Deployment



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Lean on a platform. It’s the same because it’s the same.

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demo

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Factor 12 – Admin Processes

Run admin/management processes as one-off processes

- Admin / Management processes run against a release
- The “should” run in an identical environment as the release.
- They use the same codebase and config
- They ship live with the code to avoid synch issues.
- This one has a lot of rules, be pragmatic.

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Factor 7 – Port Binding

Export Services Via Port Bindings

- Apps are deployed into containers
- Multiple containers per host
- Platform to handle port assignments and mappings

demo

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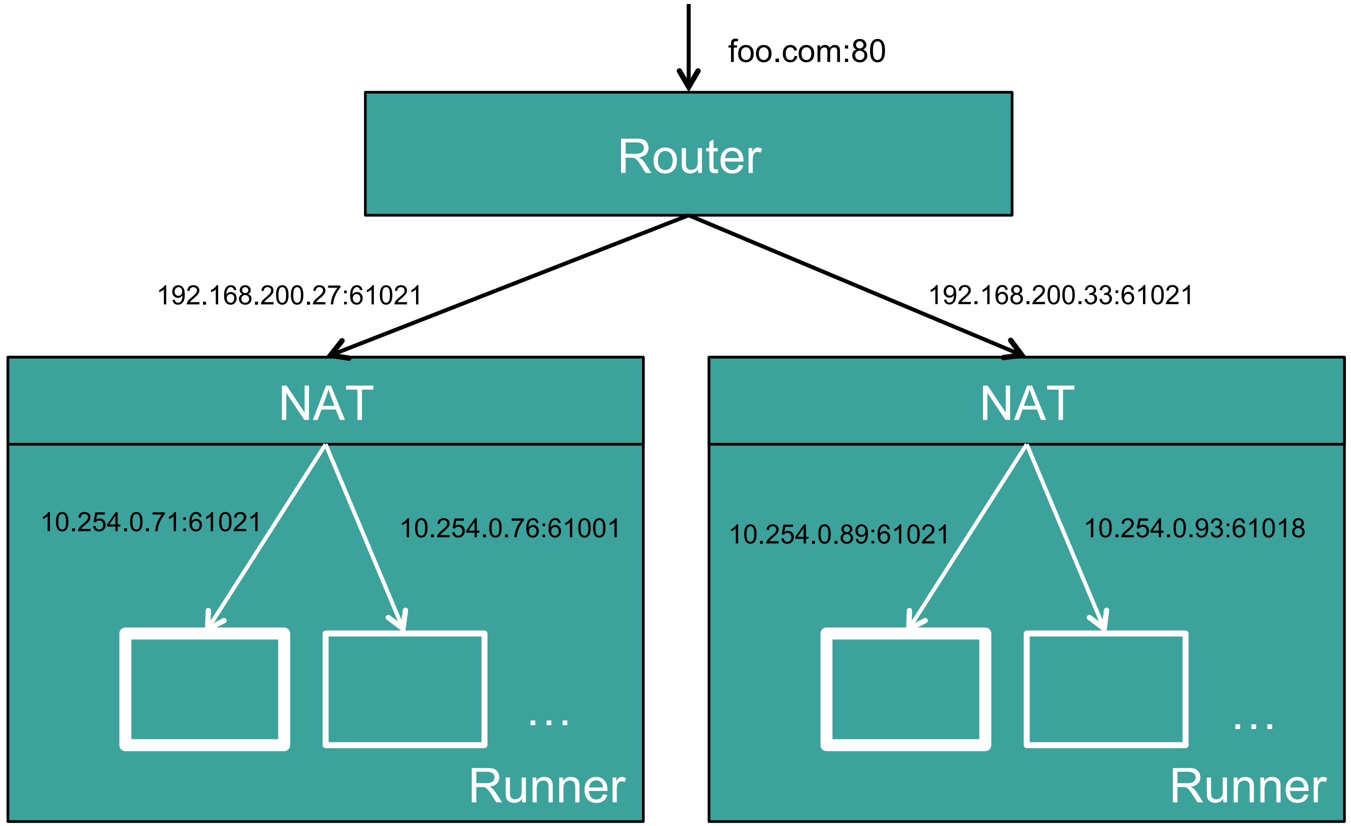

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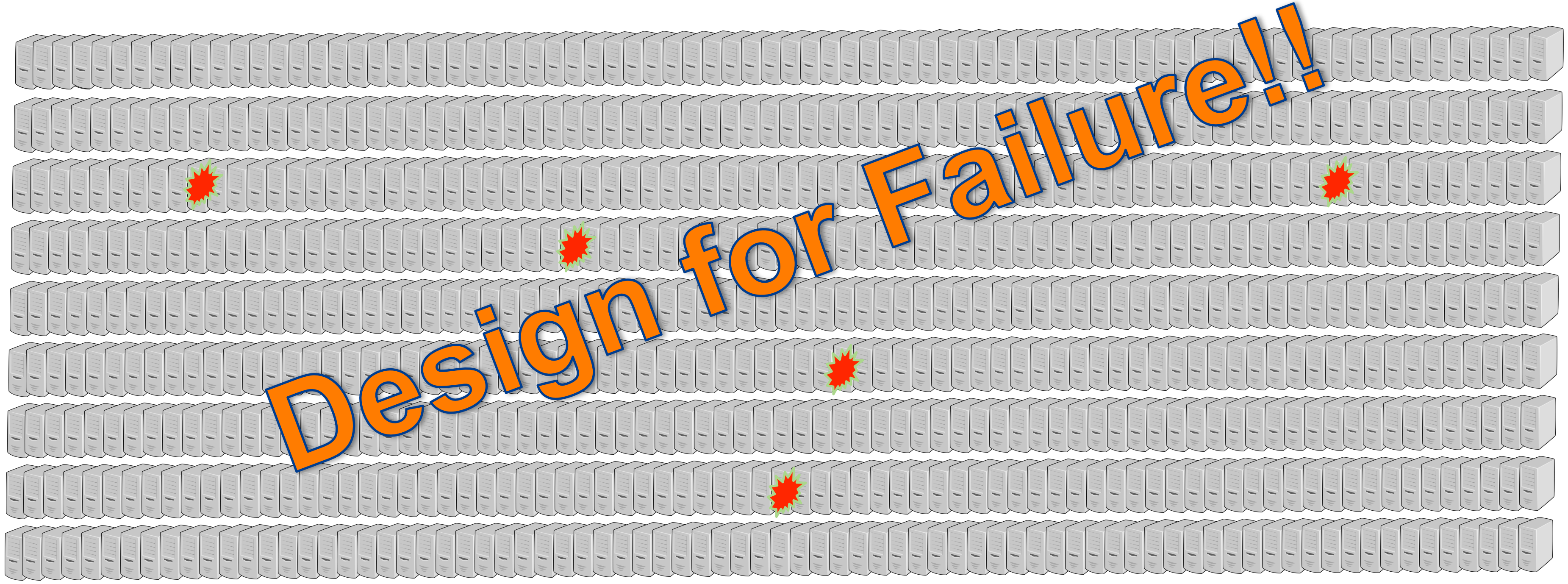
Factor 6 – Processes

Execute the app as one or more **stateless** processes



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Stateless apps allows the platform to do all sorts of things for you

demo

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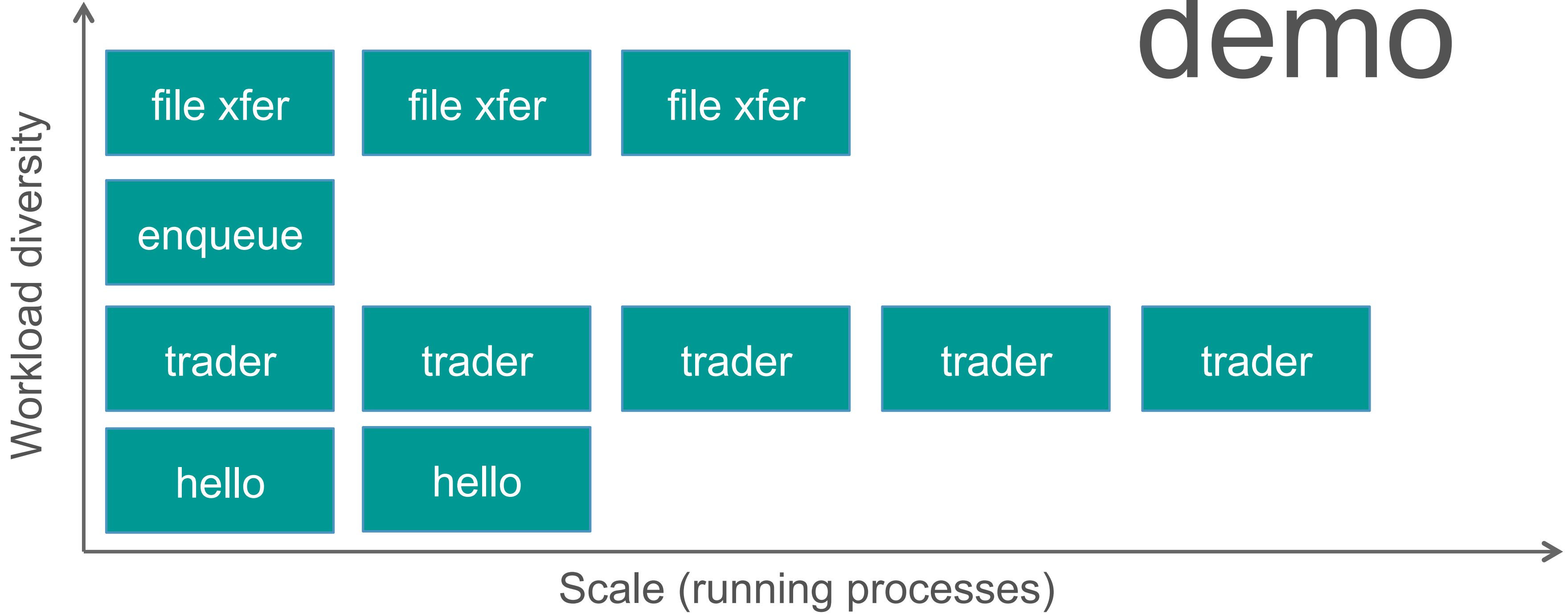
Factor 8 – Concurrency

Scale out via the process model

demo



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But that's not all…

Bonus Factors!!

- Factor 13 – Audit
  - Every app should be designed with audit in mind
    - What versions running at what ports
    - Event stream (start, stop, crash…)
- Factor 14 – AuthN/AuthZ
  - Every app should have RBAC applied

@jmckenty

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Thank you!

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@cdavisafc
@krujos

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You can check all of this out: https://github.com/cdavisafc/twelvefactorapp

Other sessions:

- (10:30 W) Spring Boot for Devops (https://2015.event.springone2gx.com/schedule/sessions/spring_boot_for_devops.html)
- (2:30 W) Spring Cloud Services (https://2015.event.springone2gx.com/schedule/sessions/cloud_native_java_with_spring_cloud_services.html)
- Migrating the Monolith (https://2015.event.springone2gx.com/schedule/sessions/migrating_the_monolith.html)

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