

# RUN YOUR JAVA CODE ON CLOUD FOUNDRY

**Andy Piper - @andypiper**

***Cloud Foundry Developer Advocate, Pivotal***



Andy Piper

social bridgebuilder  
photographer  
speaker  
techie  
developer advocate  
community lead

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Hello

I'm Andy

Developer Advocate @ Cloud Foundry

social web enthusiast

maker, educator, LEGO fan

OSS contributor

Eclipse Project Lead (Paho / MQTT)

excited by “what’s next”, Internet of Things, etc.



@andypiper

[apiper@gopivotal.com](mailto:apiper@gopivotal.com)



a few things about me



Developer Advocate?

hellz to the yeah!

@andypiper

[works on]

#cloudfoundry

[at]

@gopivotal



3 themes

openness, cloud computing,  
and Java

1. Why be / do / think Open?
2. Why is an Open Cloud Platform important?
3. Why run Java on an open cloud?

1. Why be / do / think Open?

From: [torvalds@klaava.Helsinki.FI](mailto:torvalds@klaava.Helsinki.FI)  
Newsgroups: comp.os.minix  
Date: 25 Aug 91 20:57:08 GMT  
Organization: University of Helsinki

# 1991

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An important year in software

Hello everybody out there using minix -

I'm doing a (free) operating system (just a hobby, won't be big and professional like gnu) for 386(486) AT clones.

~21 years later: Linux has won

#DOWN ALL  
TEH  
GADGETZ!



```
EXT3 FS 2.4-0.9.17, 10 Jan 2002 on sd(8,1), internal journal
EXT3-fs: recovery complete.
EXT3-fs: mounted filesystem with journal data node.
(journald starting. Commit interval 5 seconds
EXT3-fs warning: maximal mount count reached, running e2fsck is recommended
EXT3 FS 2.4-0.9.17, 10 Jan 2002 on sd(8,1), internal journal
EXT3-fs: mounted filesystem with journal data node.
mount ok
:sl and shadowusr need loadusr
loadusr.c018: Loading space 0
lib_open: No such file or directory
usrconfig.c000: creating user 0 slmon
usrconfig.c0140: /usr/app/IntEngine2.03.58.00.cran cksum 4169382515 ok
loadusr.c033: Load space 0: success
loadusr.c018: Loading space 1
lib_open: No such file or directory
usrconfig.c000: creating user 1 slmon
ADG_OUTPUT: SSH INFO SSH server listening for clients
usrconfig.c0140: /usr/app2/seatcomp1.cran cksum 3221103195 ok
usrconfig.c0140: /usr/app2/CCED_01.09.0.0_c7X.cran cksum 837032909 ok
usrconfig.c0140: /usr/app2/nhd_02.23.0.12_c7X.cran cksum 3090495800 ok
usrconfig.c0140: /usr/app2/paxus3air_04.07.0.2.cran cksum 3660042709 ok
usrconfig.c0140: /usr/app2/sdphone.cran cksum 3003620365 ok
usrconfig.c0140: /usr/app2/windowmanager_geole_01.33.0.1.cran cksum 1427042497 ok
usrconfig.c0140: /usr/app2/dsp_sys.cran cksum 2826901702 ok
usrconfig.c0140: /usr/app2/ada_dhcoreapi_01.16.0.1.cran cksum 1130060244 ok
usrconfig.c0140: /usr/app2/medic_sqlitedb_01.07.0.1.cran cksum 1009175245 ok
loadusr.c033: Load space 1: success
loadusr.c018: Loading space 2
lib_open: No such file or directory
usrconfig.c000: creating user 2 slmon
```

Linux runs everywhere

(even old versions, on crashy  
airline entertainment systems...)



The Penguin is  
triumphant!

(maybe not this one...)

Linux is ubiquitous

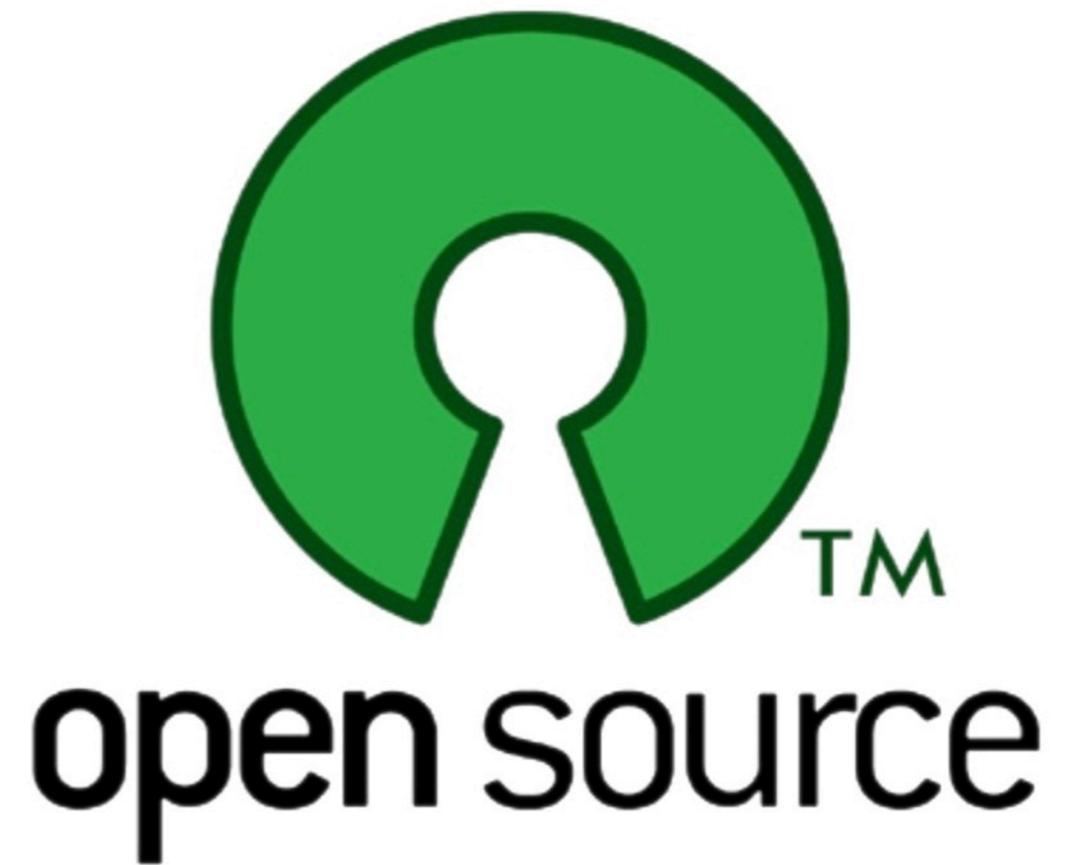
---

(but often invisible)

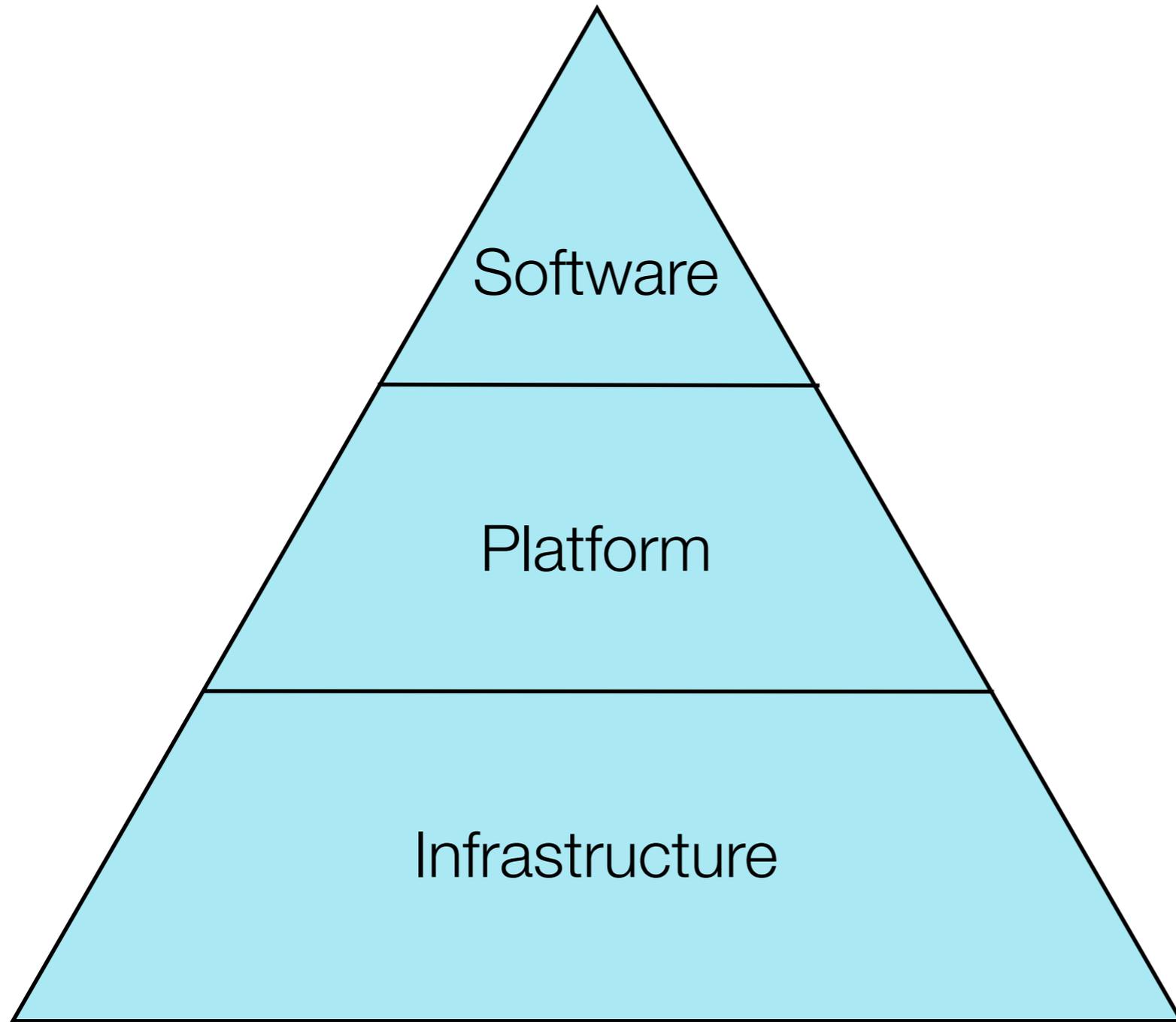


It works.

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## 2. What about Cloud?



Gmail, Salesforce,  
Flickr, Google Docs...

Google AppEngine,  
Heroku, Cloud Foundry,  
EngineYard, Apprenda...

Amazon EC2, Google CE,  
OpenStack, vSphere,  
Joyent, Cloud Stack,  
Eucalyptus...

3 layers

IaaS, PaaS, SaaS



How did we get here?

## *Infrastructure* Clouds

- consumer web companies built out according to their own needs to support *Software*



But - still need to build  
& manage *Platform*



## OPERATOR

```
cf-iaas.yml  
provision <my cloud>  
add_capacity <my cloud>
```

🕒 Cloud Deployment: 2-4 hours

## DEVELOPER

```
target <my cloud>  
push <my app>  
create <my services>  
bind <my services>  
scale <my app> +100
```

🕒 App Deployment: 30-90 seconds

An alternative approach...

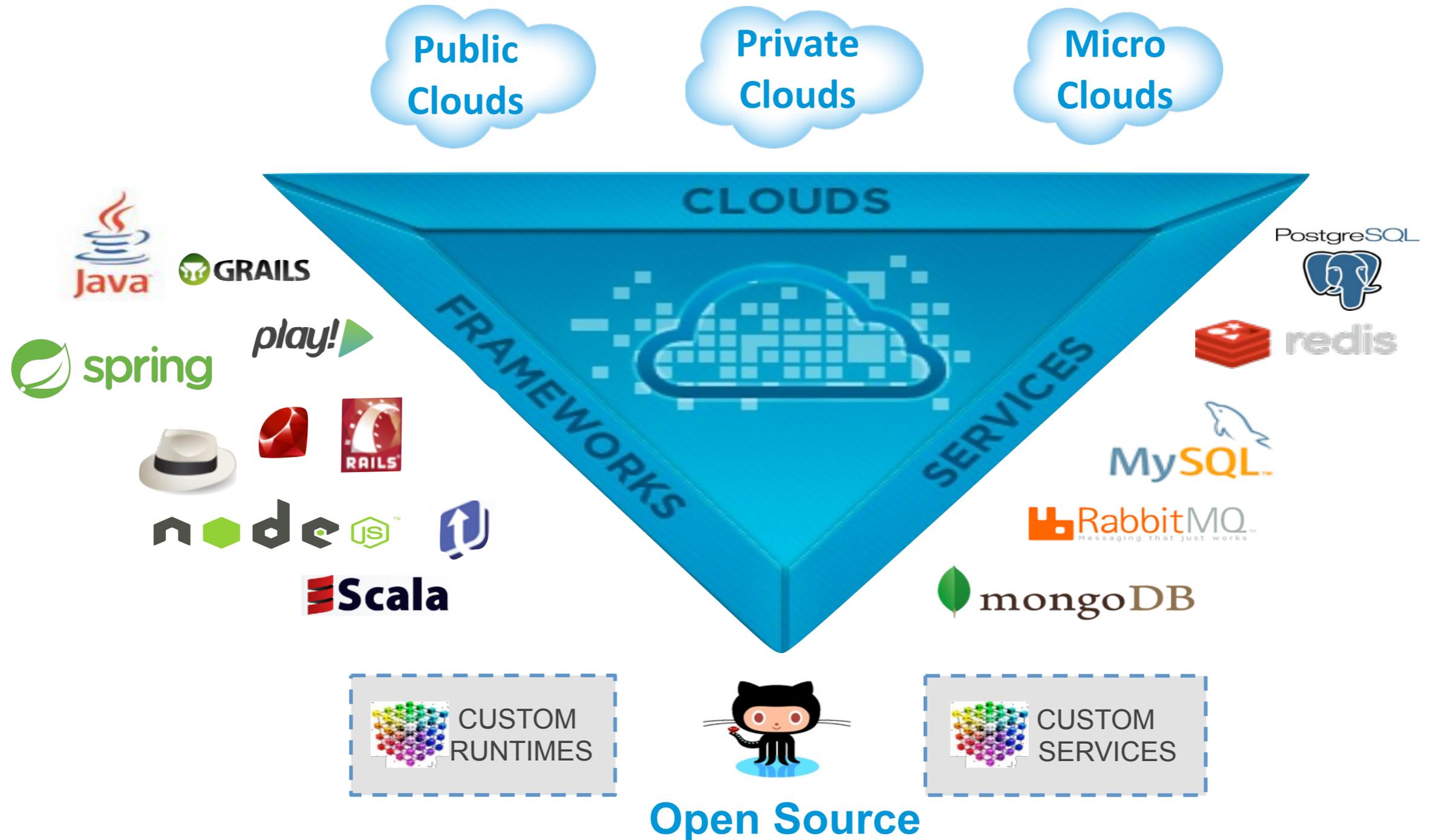
Cloud Foundry can  
make it simpler!

CLOUD FOUNDRY

# Demo



# Cloud Foundry - the Open PaaS





All the pieces to make  
your own!

“if you can’t open it, you  
don’t own it” (O’Reilly MAKE)



CLOUD  
FOUNDRY™

## The open platform- as-a-service project

cloudfoundry

Palo Alto, CA

support@cloudfoundry.com

http://www.cloudfoundry.org

Joined on Feb 16, 2011

52

public repos

16

members

Repositories

Members

Find a Repository...

All Sources Forks Mirrors



vcap-services-base

Last updated 10 hours ago

Ruby ★ 9 📄 13



vcap-services

Cloud Foundry - the open platform as a service project

Last updated 12 hours ago

Ruby ★ 332 📄 99



dea\_ng

Last updated 12 hours ago

Ruby ★ 3 📄 3



bosh

BOSH

Last updated 13 hours ago

Ruby ★ 205 📄 49

Open & public from the start

Code all on Github

Google AppEngine,  
Heroku, [Cloud Foundry](#),  
OpenShift, [Stackato](#),  
Cloudbees, [AppFog](#),  
Elastic Beanstalk,  
[anyNines](#), Apprenda...

# BUILD OWN HEROKU WITH CLOUD FOUNDRY

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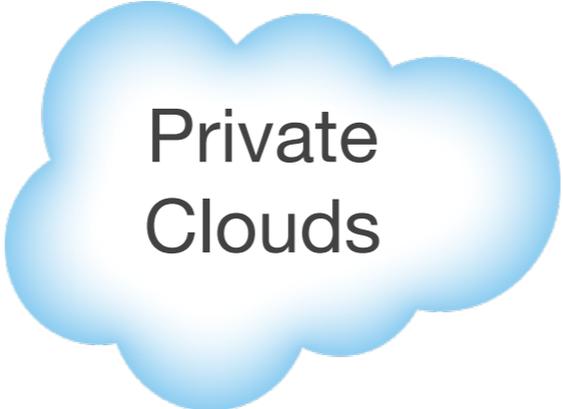
Dr Nic Williams  
Stark & Wayne LLC  
@drnic

Not all PaaSes are  
created equal...

Run on: AWS, OpenStack,  
vSphere... more to come!

# All about Choice

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Private  
Clouds

Build your own from [github.com/cloudfoundry](https://github.com/cloudfoundry), buy from Pivotal, or run a compatible private version



Public  
Clouds

At `run.pivotal.io` or *any Cloud Foundry-powered PaaS*



Micro  
Clouds

Run in a local virtual machine with identical services and runtimes (MCF, Vagrant)

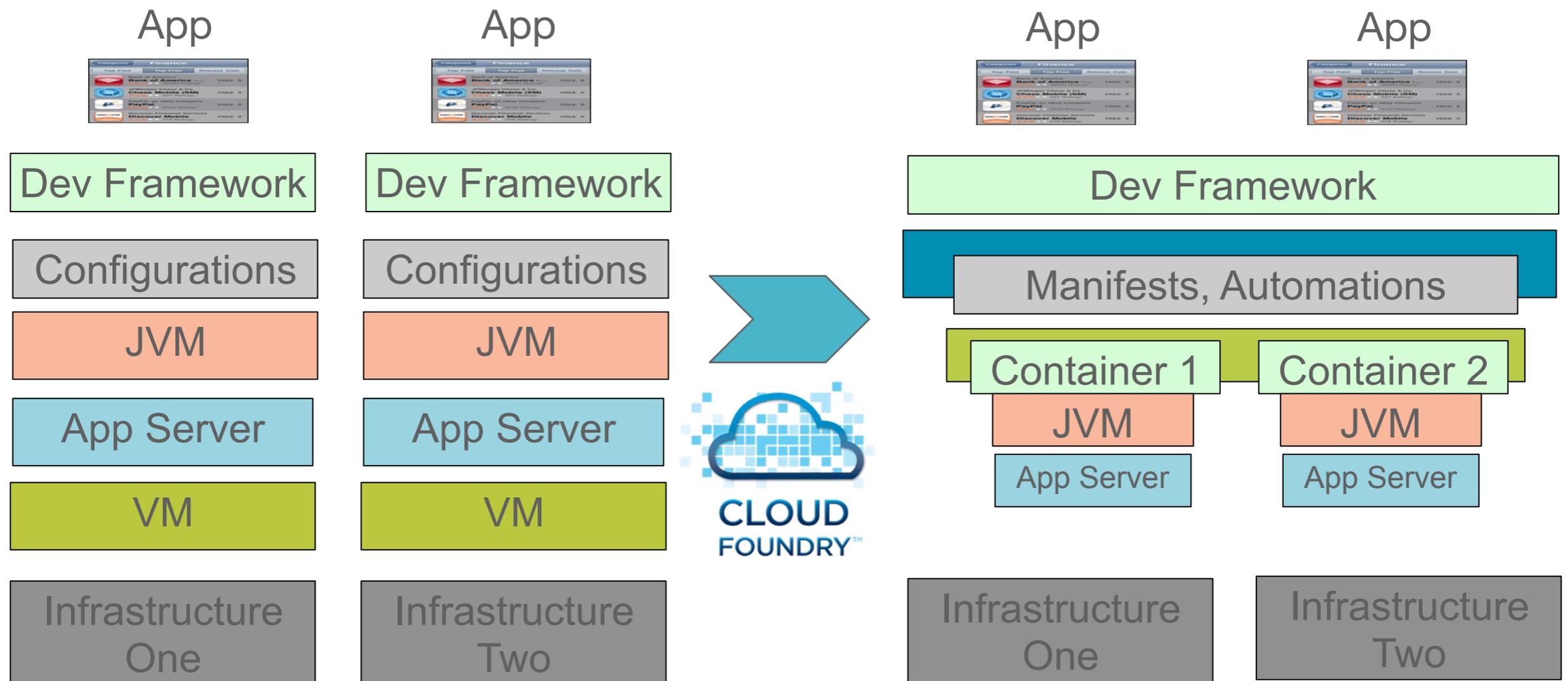
(pause)



44 years since Mach 1

3. What about Java and the JVM?

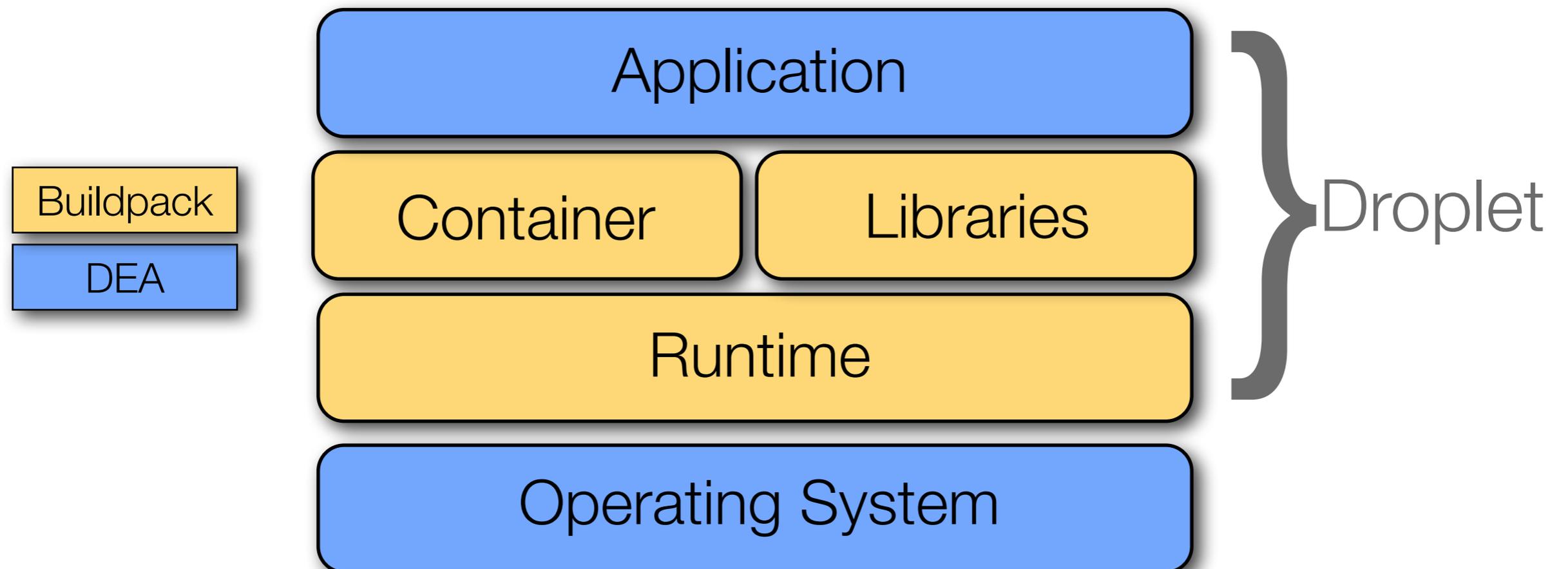
# From VM-centric to *Application Centric*



# Buildpacks

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Buildpacks are responsible for preparing the machine image for an application

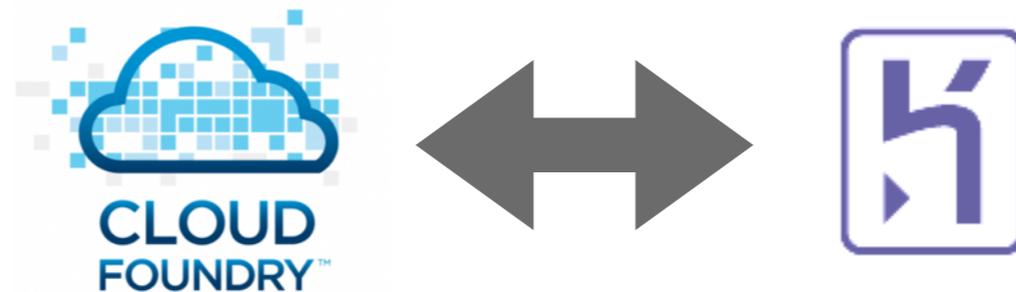


# Compatibility

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Cloud Foundry buildpacks follow the Heroku buildpack design

Cloud Foundry and Heroku buildpacks are compatible  
(if you take care to make them compatible)



Other PaaS providers are adopting the buildpack design - emerging convention

# Built-in Buildpacks

cloudfoundry / dea\_ng

star 9 fork 5

branch: master dea\_ng / buildpacks / vendor

Merge pull request #53 from glyn/master

 mariash authored 9 days ago

java @ d1fcf9b

Upgrade Java buildpack



 cloudfoundry / java-buildpack

nodejs @ 6ab2969

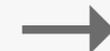
Merging local and Heroku Node manifests [finishes #46649889]



 cloudfoundry / heroku-buildpack-nodejs

ruby @ 2fc4ad8

bump ruby buildpack to support internetless-mode



 cloudfoundry / heroku-buildpack-ruby

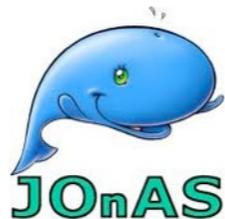


# Tested Buildpacks

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<https://github.com/cloudfoundry-community/cf-docs-contrib/wiki/Buildpacks>

## *Containers*



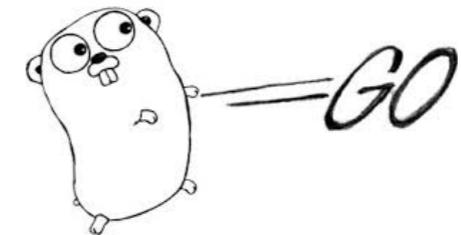
## *Languages*



Haskell



Clojure



# Java Buildpack

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Supports a variety of JVM languages, containers, and frameworks with a modular, configurable, and extensible design



# Java Buildpack Concepts



## Containers

Java main ()  
Tomcat  
Groovy  
Spring Boot CLI  
Play

## Frameworks

Spring config  
Play config  
Play JPA config  
New Relic

## JREs

OpenJDK, etc.

# Container Detection Criteria



Java main ()	<code>META-INF/MANIFEST.MF</code> exists with <code>Main-class</code> attribute set
Tomcat	<code>WEB-INF</code> directory exists
Groovy	<code>.groovy</code> file with a <code>main()</code> method, or <code>.groovy</code> file with no classes, or <code>.groovy</code> file with a shebang ( <code>#!</code> ) declaration
Spring Boot CLI	one or more POGO <code>.groovy</code> files with no <code>main()</code> method, and no <code>WEB-INF</code> directory
Play	<code>start</code> and <code>lib/play.play_*.jar</code> exist

*Choose zero or one*

# Framework Detection Criteria



Spring	<code>spring-core*.jar</code> exists
Play config	Play application detected
Play JPA config	<code>play-java-jpa</code> plugin exists in app
New Relic	New Relic service bound to app

*Choose all that apply*

# Customization

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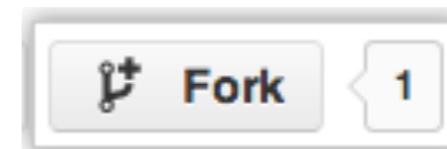


Two ways to customize the Java buildpack

**Configure** artifacts used by standard JREs, Containers, and Frameworks

**Extend** the buildpack with your own JREs, Containers, and Frameworks

Customization is done by forking the buildpack →



# Choice!

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- IBM donated WebSphere Liberty Buildpack
- <http://blog.cloudfoundry.com/2013/09/09/ibm-websphere-liberty-buildpack-contributed-to-cloudfoundry/>



## Let's build a better Enterprise.

Spring helps development teams everywhere build simple, portable, fast and flexible JVM-based systems and applications.



### BUILD ANYTHING

Write clean, testable code against the infrastructure components of your choice and accomplish any task – without re-inventing the wheel.



### RUN ANYWHERE

Keep it portable – Spring-based apps run anywhere the JVM does. Deploy standalone, in an app server, on a PaaS or all of the above.



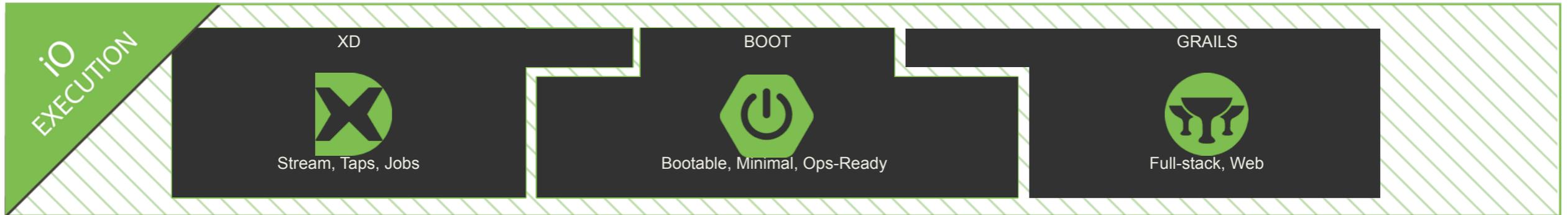
### REST ASSURED

Code with confidence – Spring provides an open programming model that is comprehensive, cohesive, widely understood and well-supported.

the new Spring

[spring.io](http://spring.io)

# spring



# Groovy and Spring Boot

---



**Rob Winch**  
@rob\_winch

 [Following](#)

[@Controller](#)

```
class ThisWillActuallyRun {  
    @RequestMapping("/")  
    @ResponseBody  
    String home() {  
        "Hello World!"  
    }  
}
```

# Groovy and Spring Boot

---



A screenshot of a Twitter post. The user is Gregg Bolinger (@GDBolinger). The tweet content is a Groovy code snippet for a Grails controller. The code defines a class `ThisWillActuallyRunController` with a `home()` method that renders "Hello World!". The tweet includes mentions of @rob\_winch, @glaforge, and @controller, and hashtags #Grails and #FTW. There are also buttons for user interaction: a dropdown menu and a "Follow" button.

 **Gregg Bolinger**  
@GDBolinger

[@rob\\_winch](#) [@glaforge](#) [@controller](#)

```
class ThisWillActuallyRunController {  
  def home() {  
    render "Hello World!"  
  }  
}
```

[#Grails](#) [#FTW](#)

# Groovy and Spring Boot

---



**Dave Syer**  
@david\_syer

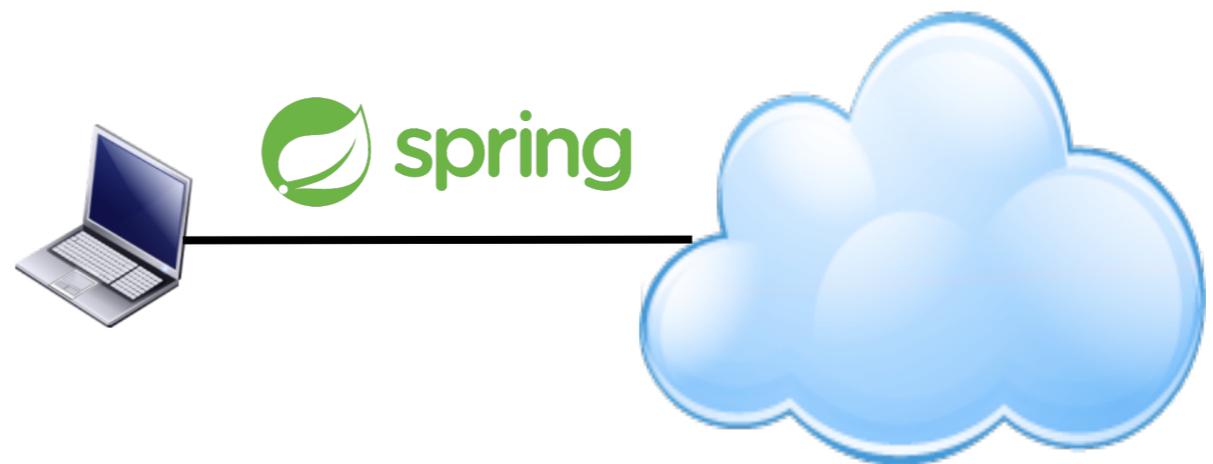
 **Following**

[@rob\\_winch](#):  
// JSON example  
@RestController  
class AndThis {  
 @RequestMapping("/")  
 def home() {  
 [hello: "world"]  
 }  
}

# Spring and the Cloud

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- Goal: deploy Spring apps to the cloud without changing a single line of code
- Cloud Foundry automatically re-configures bean definitions to bind to cloud services
- Works with Spring and Grails



# Portability

---



ramnivas  
@ramnivas



Following

Announcing spring-cloud  
[github.com/spring-project...](https://github.com/spring-project/spring-cloud) #spring  
#cloudfoundry #heroku

## Usage pattern: Application Developers

---

- Create a `CloudFactory` instance. Creation of a `CloudFactory` instance is a bit expensive, so caching such an instance is recommended. If you are using a dependency inject frameworks such as Spring, creating a bean for `CloudFactory` will achieve the caching effect.

```
CloudFactory cloudFactory = new CloudFactory();
```

- Obtain a suitable `Cloud` for the environment in which the application is running.

```
Cloud cloud = cloudFactory.getCloud();
```

- Use the `Cloud` instance to get access to application info, service infos, and create service connectors.

```
// ServiceInfo has all the information necessary to connect to the underlying service  
cloud.getServiceInfos();
```

```
// Alternatively, let the cloud create a service connector for you  
DataSource ds = cloud.getServiceConnector("inventory-db", DataSource.class, null /* default config */);
```

SPRING

Demo



spring



4. ... the end?



USING CLOUD FOUNDRY

RUNNING CLOUD FOUNDRY

GET INVOLVED

## Cloud Foundry Blog

← UK Charity Raises Record Donations Powered by Cloud Foundry

Static.com Adds Hadoop Support for Cloud Foundry →

### Want to Contribute to Cloud Foundry? Come on in!

Posted on May 16, 2013 by Andy Piper

Cloud Foundry is an Open Platform-as-a-Service, and an Open Source project. It [has attracted phenomenal interest from the community](#) - including partners, companies using the code internally, and those individual developers with a passion for getting involved. You can find [the source code on Github](#). Community contributions are what help to make the platform so extensible. We are always happy when we receive a Github pull request to offer new functionality or fixes! We also appreciate bug reports submitted through Github Issues.

Looking at the Cloud Foundry project as a whole though... where should you start?



Join us!

... a pull request is all it takes!

# Connect

<http://twitter.com/andypiper>

<http://andypiper.co.uk>

<http://slideshare.net/andypiper>

# Image credits

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- Cloud cover slide <http://www.flickr.com/photos/sjkingo/3150155150/>
- Star Wars Cookies <http://www.flickr.com/photos/betsyweber/4961703633/>  
(Geek Pride Day, May 25 - <http://readwrite.com/2013/05/23/geek-pride-day-celebrate>)
- Happy Tux <http://igloo.crystalxp.net/ZeNDaMs>
- Signpost <http://www.flickr.com/photos/16002150@N08/2006266695/>
- Other images are author's own, or royalty-free and CC-licensed works from Wikimedia Commons
- Build your own Heroku video <http://www.youtube.com/watch?v=e0EprkBamvQ>