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Spring Boot Primer

Getting Started with Spring Boot to build Cloud Native Apps.

Agenda

- Challenges building non-Boot applications
- What is Spring Boot?
- Capabilities
- Demos Throughout

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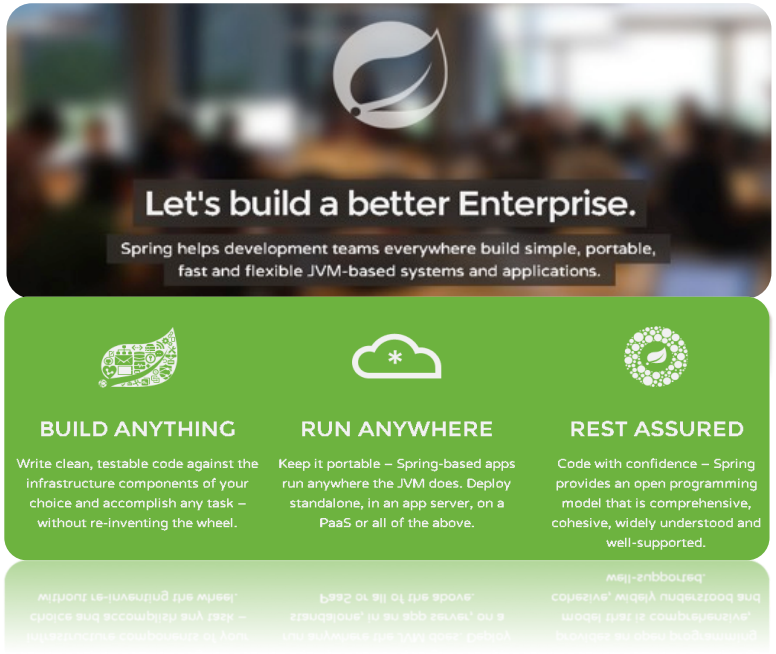
What is Spring IO?

the #1 enterprise Java application development framework

- Embodiment of best industry dev practices
- The best of Java OSS, curated & improved
- OSS, Apache 2.0 licensed
- Proven, mature, since 2004
- Well understood and documented
- Millions of downloads
- Used heavily by Netflix and F2000




IO EXECUTION
Spring XD
Boot
IO COORDINATION
Cloud
IO FOUNDATION
Integration
Batch
Big Data
Web
Relational
Data Access
DATA
Non-Relational
Data Access
CORE
Framework
Security
Groovy
Reactor

Challenges writing non-Boot applications

Version incompatibility of libraries

```
Exception in thread "main" java.lang.NoClassDefFoundError: javax/transaction/SystemException
        at java.lang.Class.forName0(Native Method)
        at java.lang.Class.forName(Class.java:344)
        at org.jboss.logging.Logger$1.run(Logger.java:2554)
        at java.security.AccessController.doPrivileged(Native Method)
        at org.jboss.logging.Logger.getMessageLogger(Logger.java:2529)
        at org.jboss.logging.Logger.getMessageLogger(Logger.java:2516)
        at org.hibernate.internal.CoreLogging.messageLogger(CoreLogging.java:28)
        at org.hibernate.internal.CoreLogging.messageLogger(CoreLogging.java:24)
        at org.hibernate.cfg.Configuration.<clinit>(Configuration.java:86)
        at com.mycompany.ContactManager.main(ContactManager.java:20)
Caused by: java.lang.ClassNotFoundException: javax.transaction.SystemException
        at java.net.URLClassLoader$1.run(URLClassLoader.java:372)
        at java.net.URLClassLoader$1.run(URLClassLoader.java:361)
        at java.security.AccessController.doPrivileged(Native Method)
        at java.net.URLClassLoader.findClass(URLClassLoader.java:360)
        at java.lang.ClassLoader.loadClass(ClassLoader.java:424)
        at sun.misc.Launcher$AppClassLoader.loadClass(Launcher.java:308)
        at java.lang.ClassLoader.loadClass(ClassLoader.java:357)
        ... 10 more
```

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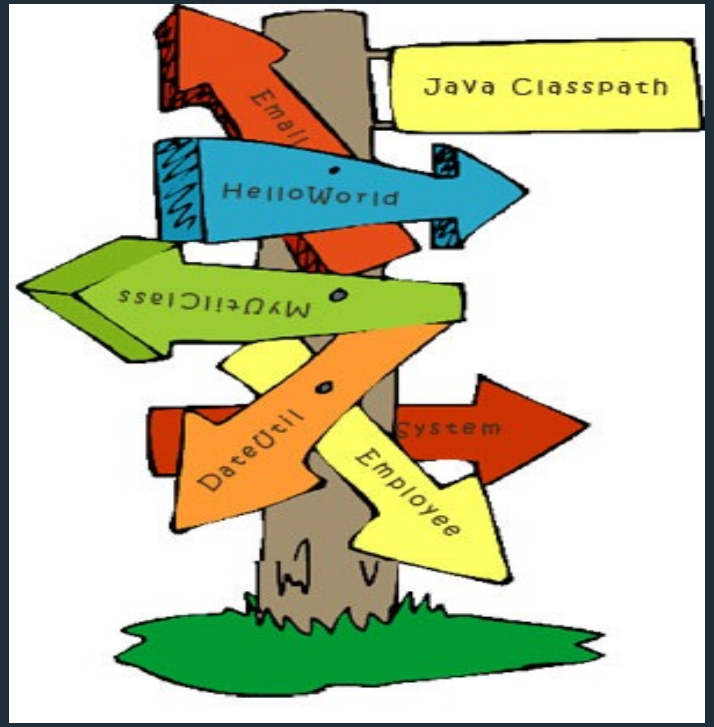
Challenges building non-Boot applications

- `Classpath` errors
  - A Jar is missing
  - There is one Jar too many
  - A class is not visible where it should be



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Configuration

- Maven and Spring

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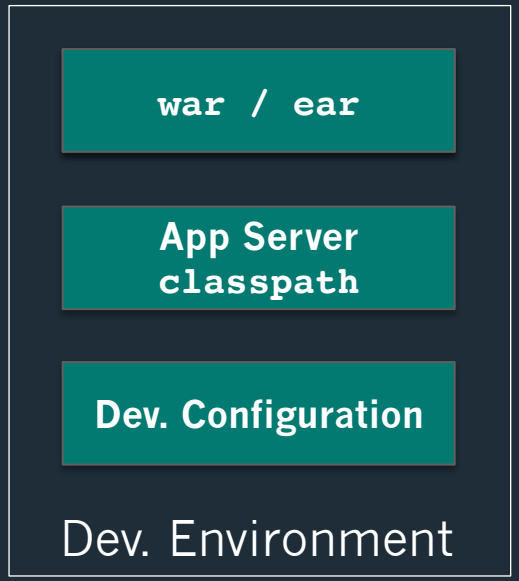
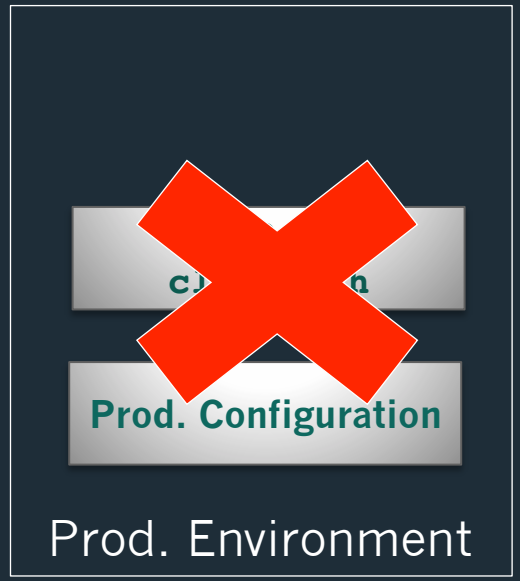
Challenges building non-Boot applications

Standard `war/ear` packaging causes drift across environments





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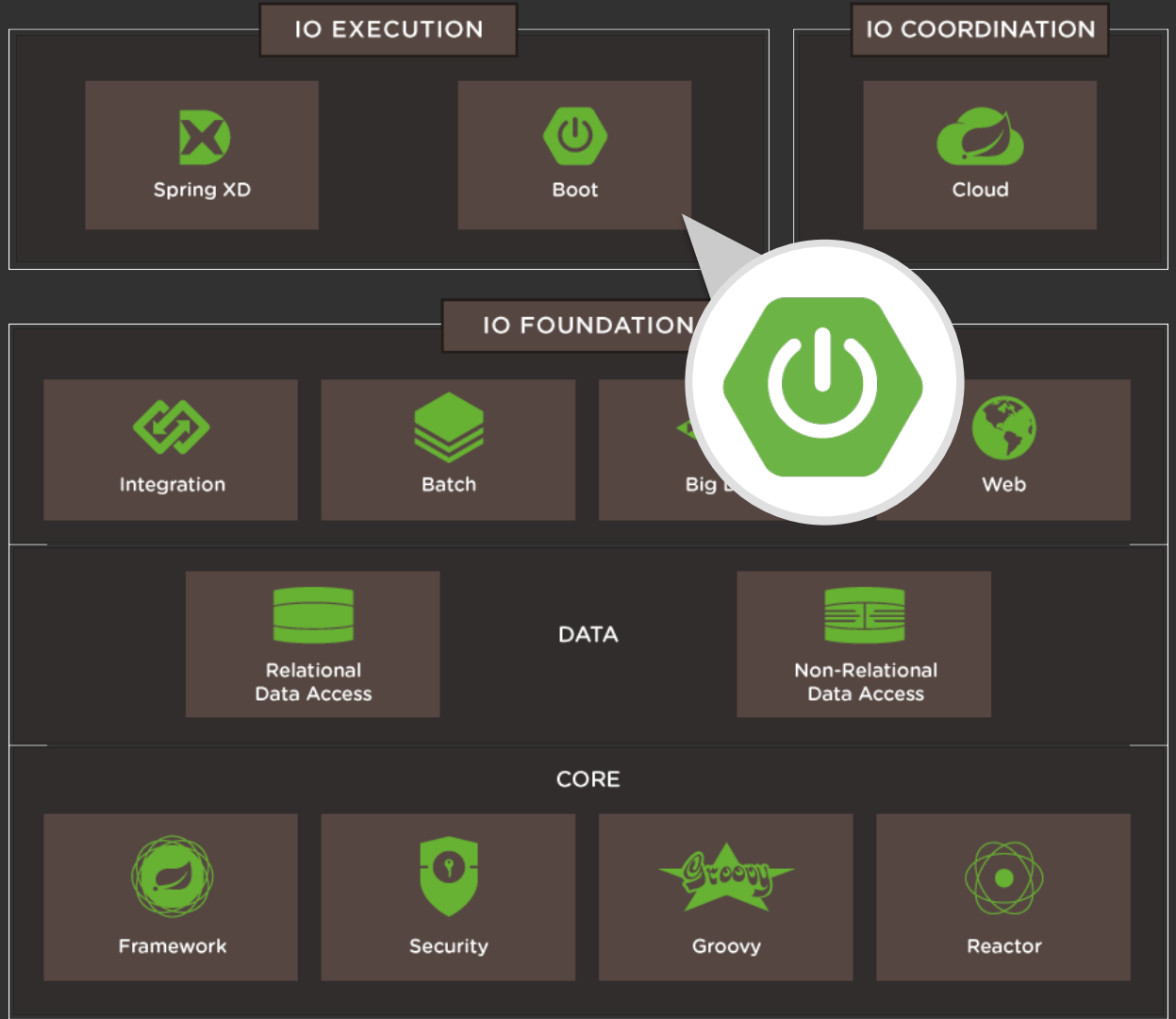
What is Spring Boot?

- Spring applications typically require a lot of setup
  - Consider working with JPA. You need:
    - Datasource, TransactionManager, EntityManagerFactory ...
  - Consider a web MVC app. You need:
    - WebApplicationInitializer / web.xml, ContextLoaderListener, DispatcherServlet, ...
  - An MVC app using JPA would need all of this

- *BUT: Much of this is predictable*
  - Spring Boot can do most of this setup for you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What is Spring Boot?

An opinionated framework to simplify bootstrapping and development of new Spring Applications

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Spring Boot

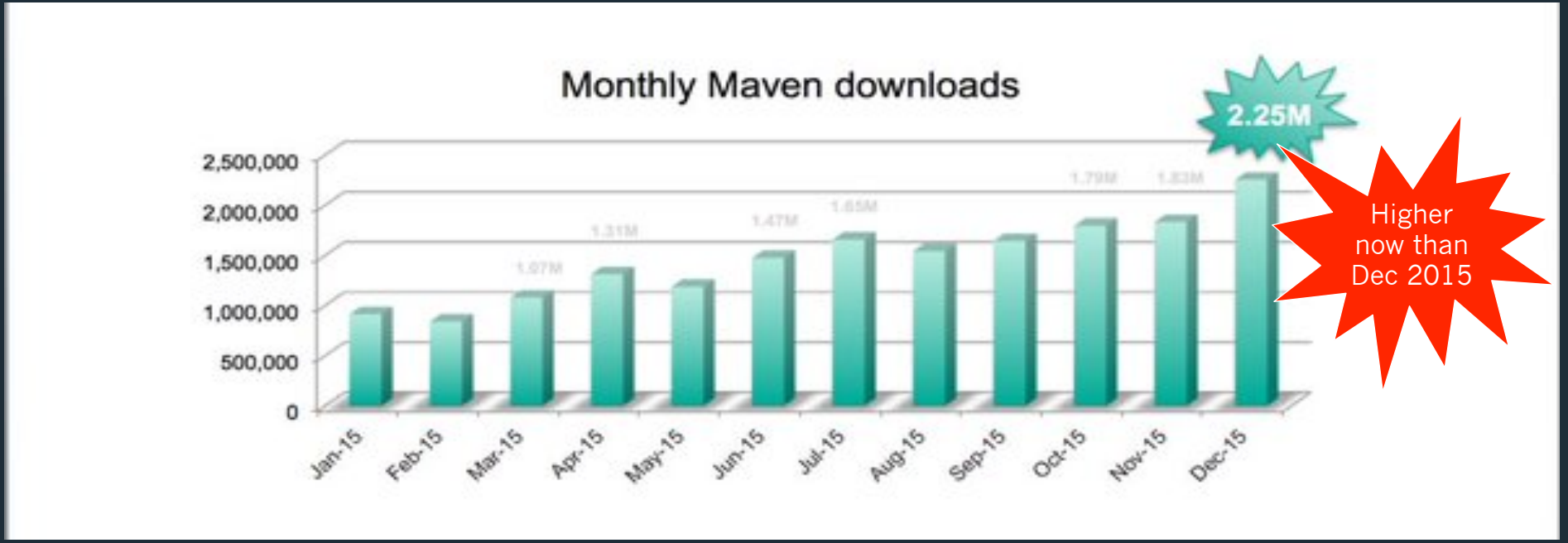
Dynamic language productivity with maturity of enterprise Java

Cloud Native: Direct support for Microservices, NetflixOSS ++

Fully automated app server configuration and deployment

Production ready Ops metrics out of the box, with a switch

Spring Boot Adoption



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Capabilities

- Provides a consistent and easy way to a start project
- Manages project dependencies
- Packages deployable artifacts prevent configuration drift across environments
- Provides conditional configuration across environments
- Provides tools to improve developer productivity
- Keeps you from writing explicit configuration
- Exposes endpoints to manage and monitor applications in production

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Spring Initializr

A configurable service to consistently and easily generate a quickstart project

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Spring Initializr

- Generates a Spring Boot project structure.
- Provides a Maven/Gradle build specification.
- Doesn’t generate application code.
- You can customize the Spring Initialzr
  - `https://github.com/spring-io/initializr/`

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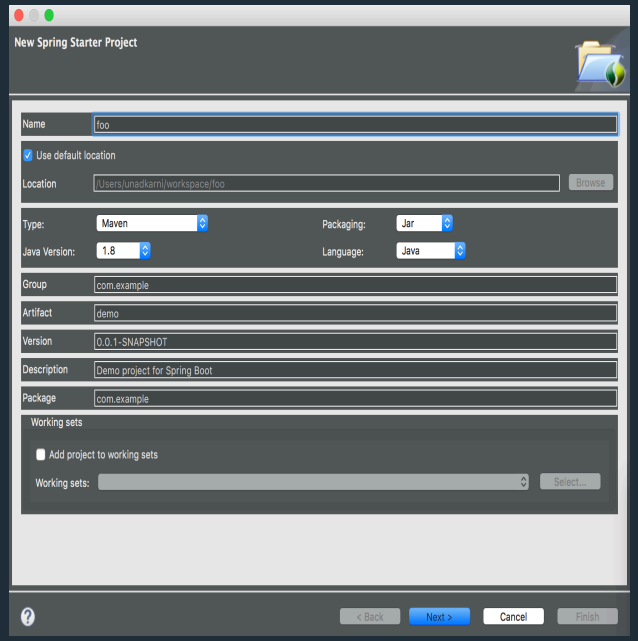
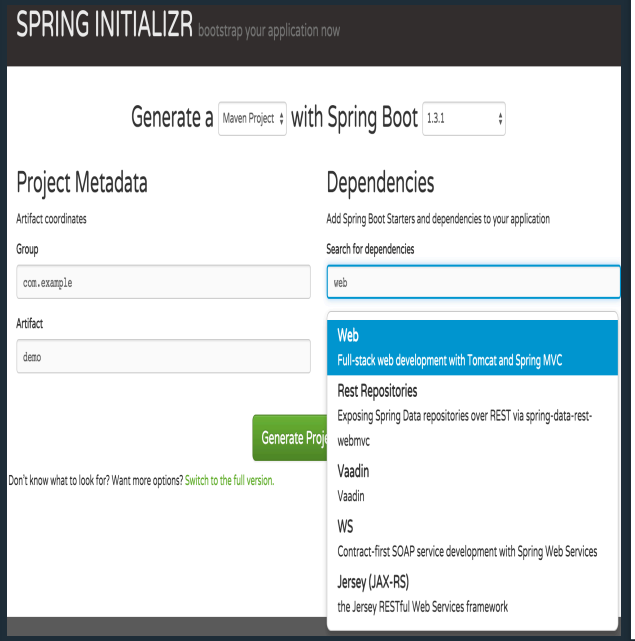
Supported Interfaces

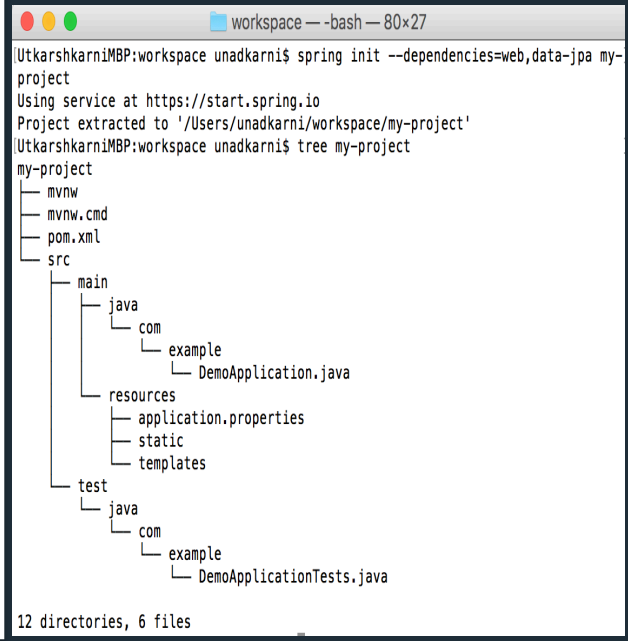
1. IDE



2. Web-based interface



3. Spring Boot CLI



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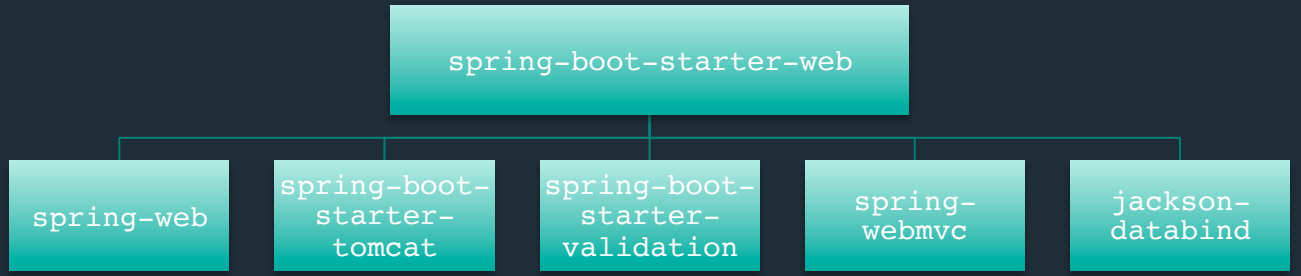
Spring Boot starters

- Are virtual packages deployed to Maven central
- They pull in other dependencies while containing no code of their own



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Project `pom.xml`

- Set parent of your `pom.xml` as `spring-boot-starter-parent`
  - `Inherit preset version numbers`

```xml
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>

    <groupId>com.example</groupId>
    <artifactId>demo</artifactId>
    <version>0.0.1-SNAPSHOT</version>
    <packaging>jar</packaging>

    <name>demo</name>
    <description>Demo project for Spring Boot</description>

    <parent>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-parent</artifactId>
        <version>1.3.1.RELEASE</version>
        <relativePath /> <!-- lookup parent from repository -->
    </parent>
```

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Starters vs Current Practice

Starter versions determined by version of Spring Boot used.

No explicit version numbers. Guaranteed to be compatible.

```
<dependencies>
    <dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-data-jpa</artifactId>
    </dependency>
    <dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-web</artifactId>
    </dependency>
    <dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-thymeleaf</artifactId>
    </dependency>
    <dependency>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-test</artifactId>
        <scope>test</scope>
    </dependency>
</dependencies>
```

Concise. Boot pom.xml without version numbers.

Are the version numbers compatible with each other?

Is the list of dependencies complete?

```
<dependencies>
    <dependency>
        <groupId>org.springframework</groupId>
        <artifactId>spring-web</artifactId>
        <version>4.1.6.RELEASE</version>
    </dependency>
    <dependency>
        <groupId>org.thymeleaf</groupId>
        <artifactId>thymeleaf-spring4</artifactId>
        <version>2.1.4.RELEASE</version>
    </dependency>
    <dependency>
        <groupId>org.springframework.data</groupId>
        <artifactId>spring-data-jpa</artifactId>
        <version>1.9.2.RELEASE</version>
    </dependency>
    <dependency>
        <groupId>org.hibernate</groupId>
        <artifactId>hibernate-entitymanager</artifactId>
        <version>5.0.6.Final</version>
    </dependency>
    <dependency>
        <groupId>com.h2database</groupId>
        <artifactId>h2</artifactId>
        <version>1.4.190</version>
    </dependency>
</dependencies>
```

Verbose. Non-boot pom.xml with version numbers.

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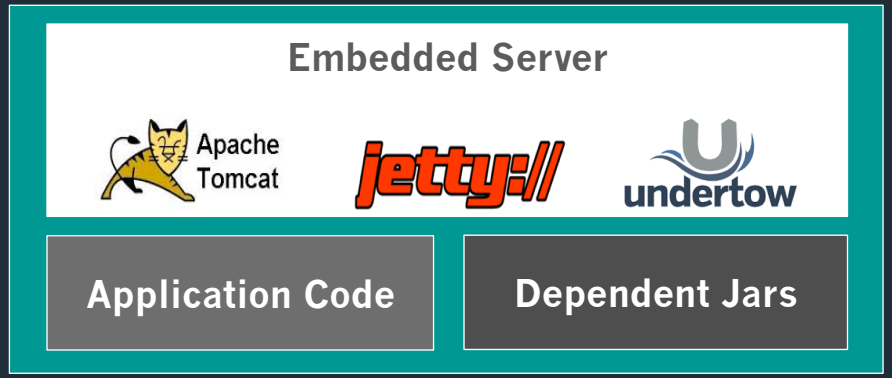
Packaging – Make Jar not War

Boot's Maven / Gradle plugins produce an executable *"fat jar"*




```
<build>
    <plugins>
        <plugin>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-maven-plugin</artifactId>
        </plugin>
    </plugins>
</build>
```

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Benefits of executable *fat jars*

- No installation of application servers
- No setting `classpath`
- Promotes consistency across environments
- Cloud-friendly
- Can be started as Unix services using
  - `init.d`
  - `systemd`

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Profiles

Segregate parts of the application configuration and make it available in certain environments via

- Annotations
- Properties file

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@Profile

Mark `@Component` or `@Configuration` with `@Profile` to limit when it is loaded.

```
@Configuration
@Profile("development")
public class DevelopmentConfiguration {
    // The @Profile requires that the "development"
    // profile be active at runtime
    // for this configuration to be applied.
    // Activate this profile in
    // properties file with spring.profile.active=development
    // command line with --spring.profiles.active=development
}
```

```
@Configuration
@Profile("production")
public class ProductionConfiguration {
    // The @Profile requires that the "production"
    // profile be active at runtime
    // for this configuration to be applied.
    // Activate this profile in
    // properties file with spring.profile.active=production
    // command line with --spring.profiles.active=production
}
```

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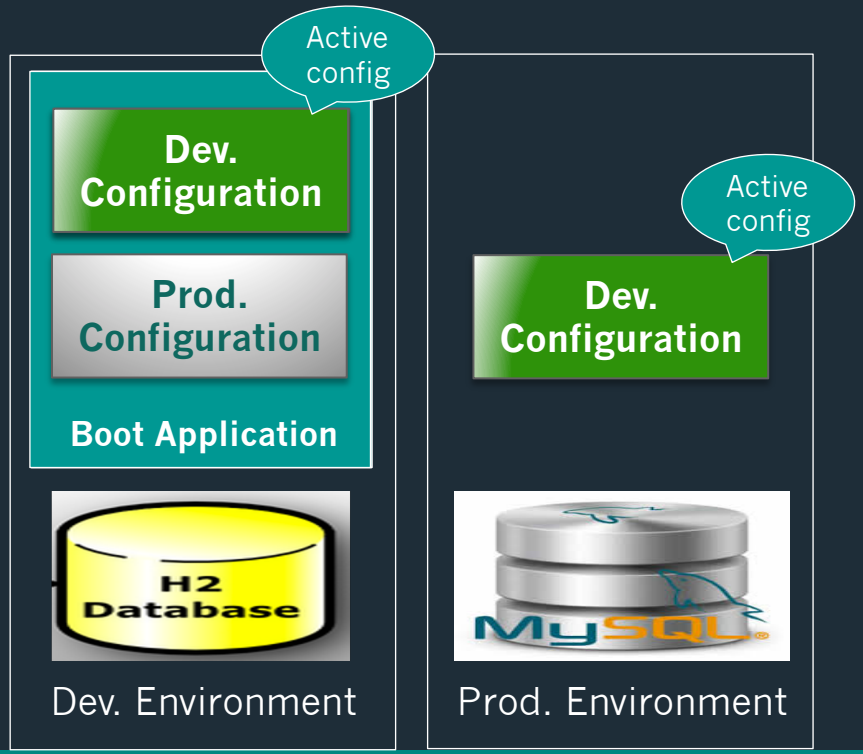
Profiles



Checkout code from source control

Build an executable jar

Configuration activated based on active profile

Deploy anywhere

No Code Changes

No Configuration Changes

It Just Works!

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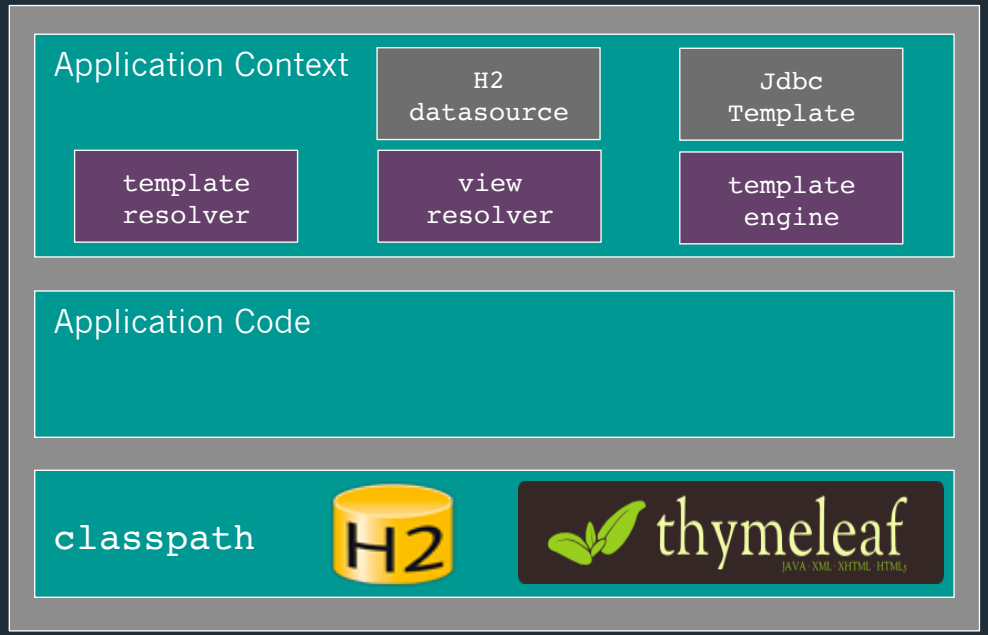
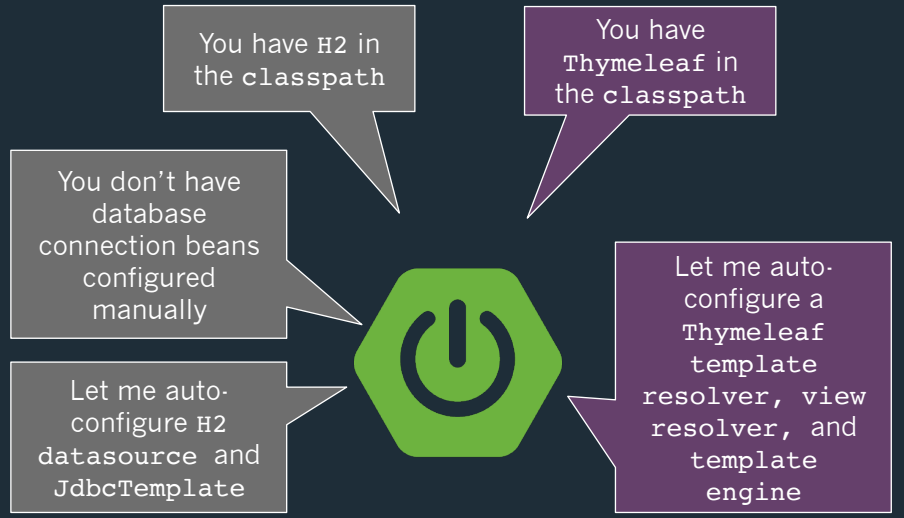
Auto-Configuration

Automatically configures application based on the `classpath`





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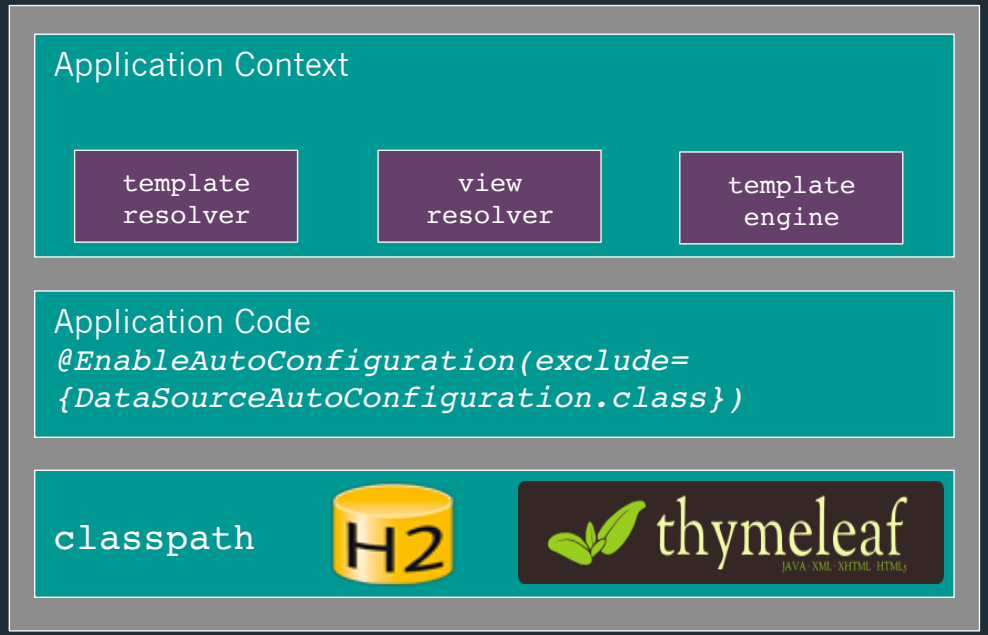
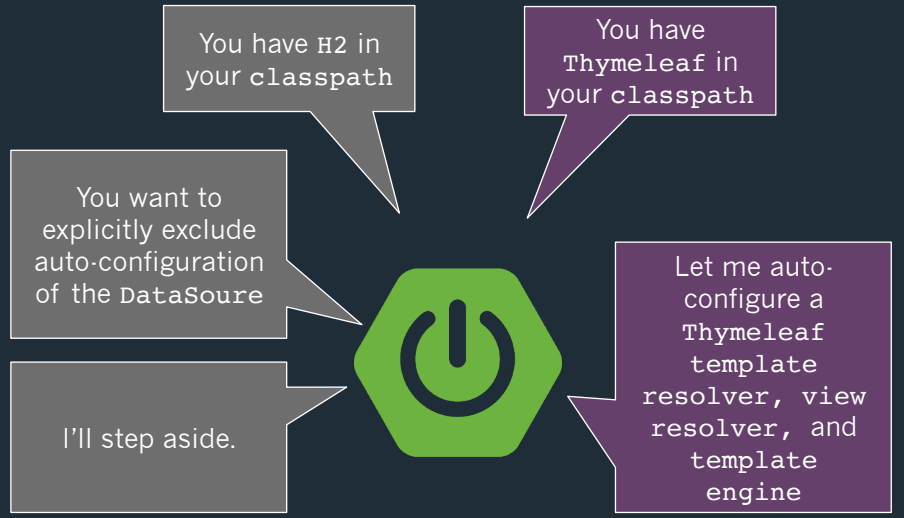
Override Auto-Configuration

Explicitly exclude auto-configuration





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Actuator

Offers production-ready features such as monitoring and metrics to improve operator efficiency

```
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-actuator</artifactId>
</dependency>
```

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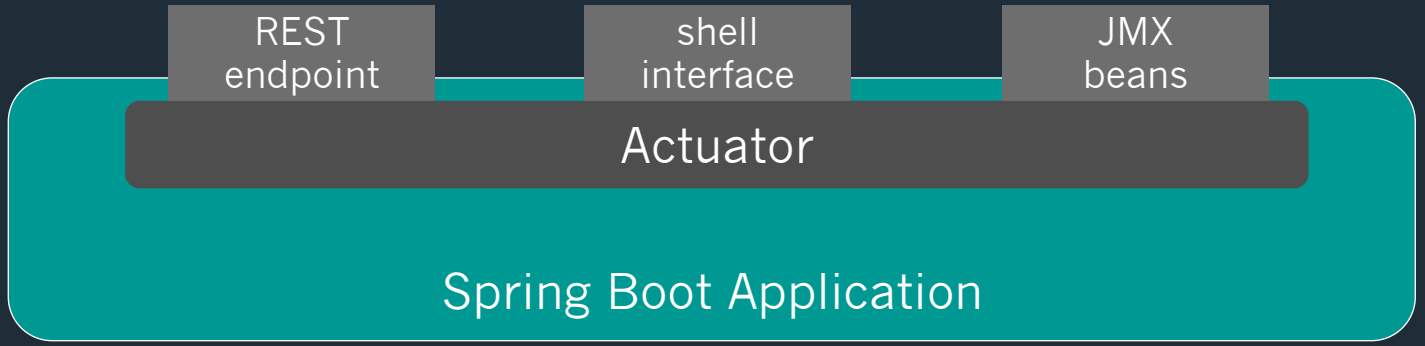
Actuator

- Services exposed through
  - HTTP endpoints for Spring MVC Applications
  - shell interface
  - JMX Beans



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Types of Actuator Endpoints

Actuator endpoints can be organized into three categories

Configuration
- /beans
- /autoconfig
- /env
- /configprops
- /controller

Metrics
- /metrics
- /trace
- /dump

Miscellaneous
- /shutdown
- /info

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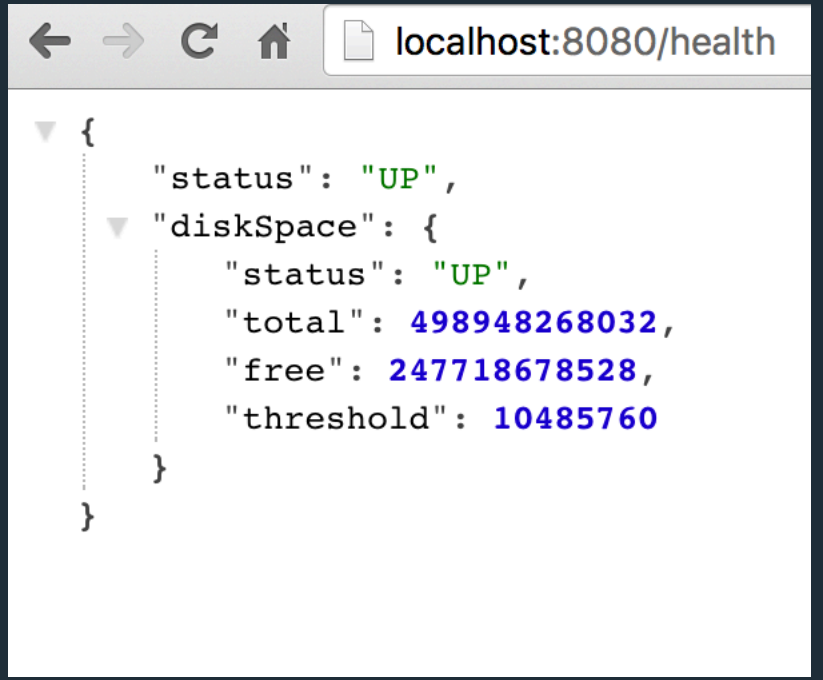
/health

Reports health metrics for the application

- Each check returns a `Health` object
  - `status`
    - `UP`
    - `DOWN`
    - `UNKONWN`
    - `OUT_OF_SERVICE`
  - Possibly with details
- Plugin own health definitions



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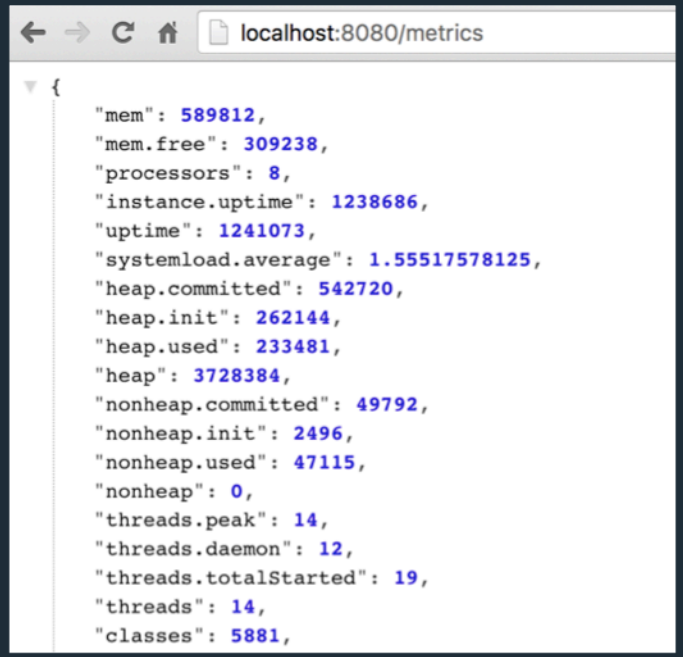
/metrics

Reports application metrics such as

- Memory usage and
- HTTP request counters



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Spring Boot & Cloud Foundry

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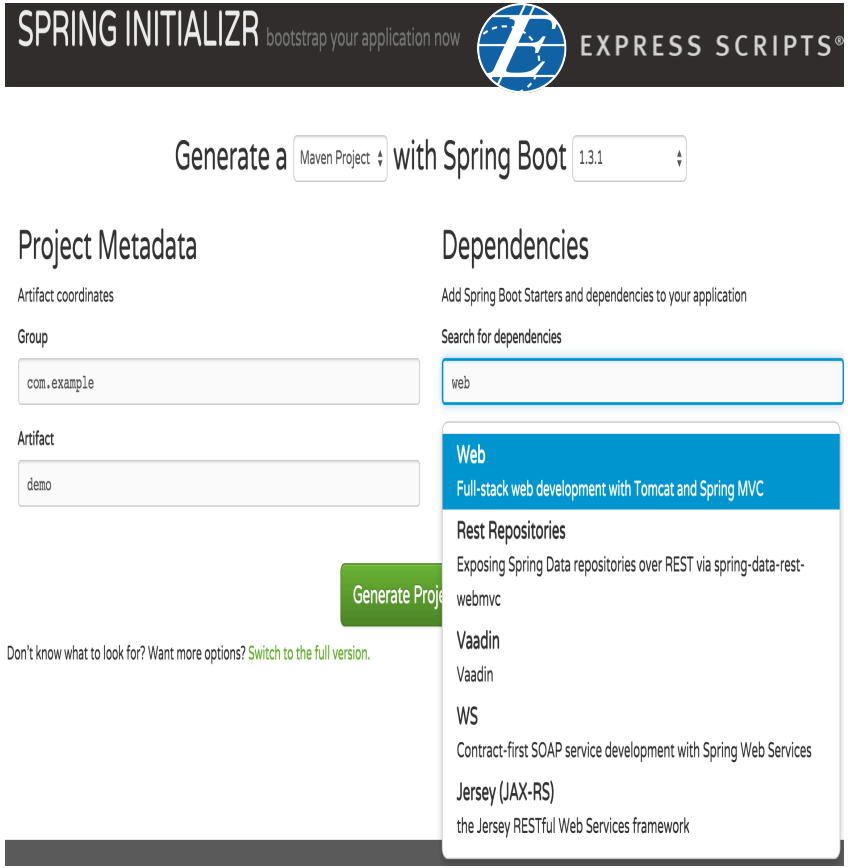
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Artifact coordinates
Group
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Artifact
demo
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Add Spring Boot Starters and dependencies to your application
Search for dependencies
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Web
Full-stack web development with Tomcat and Spring MVC
Rest Repositories
Exposing Spring Data repositories over REST via spring-data-rest-webmvc
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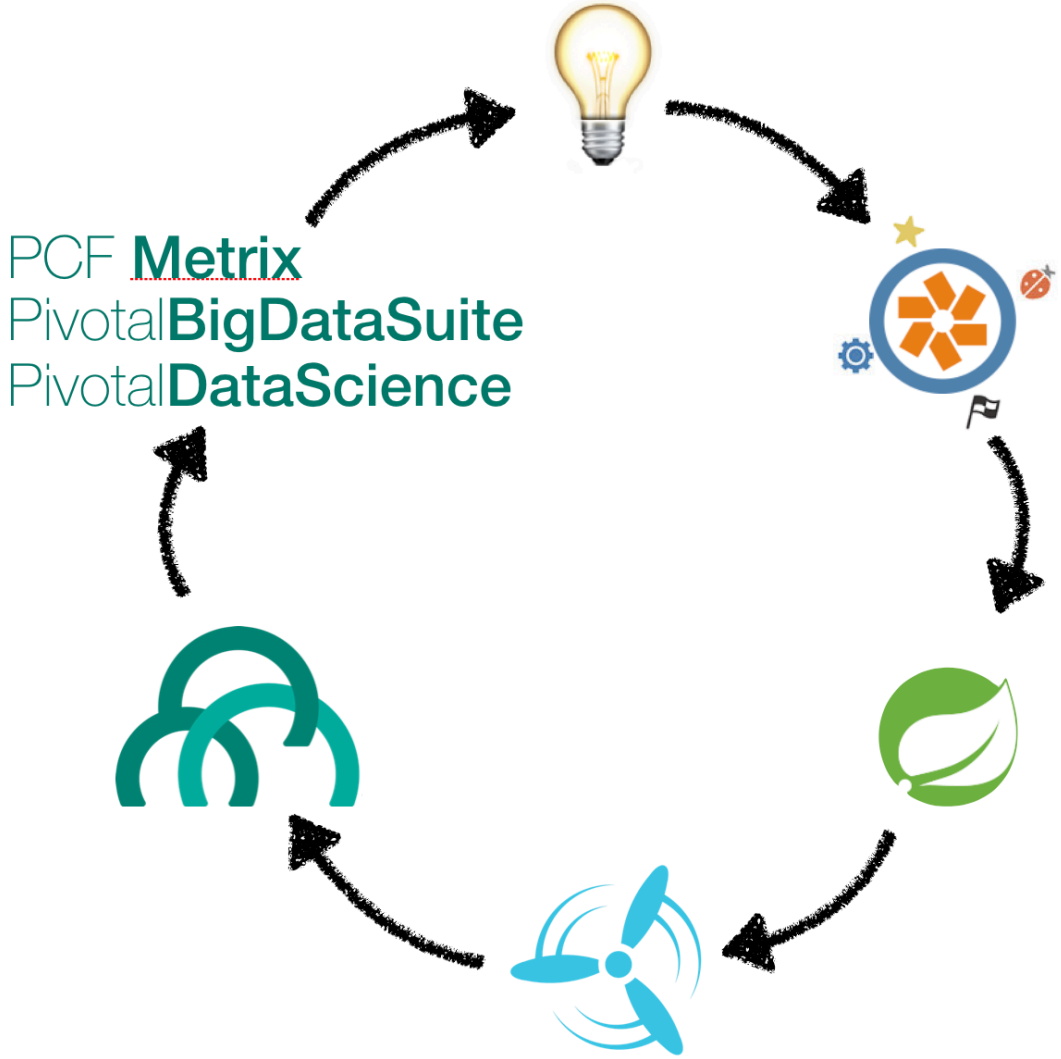
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