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Cloud Native Workshop

Spring Boot and Actuator

Pivotal Cloud Foundry

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Agenda

1. Challenges building non-Boot applications
2. What is Spring Boot?
3. Capabilities

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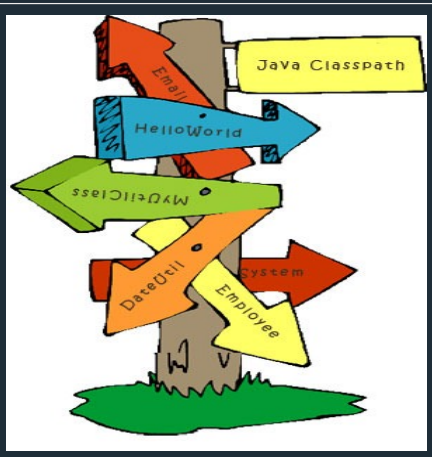
`Classpath` Hell

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



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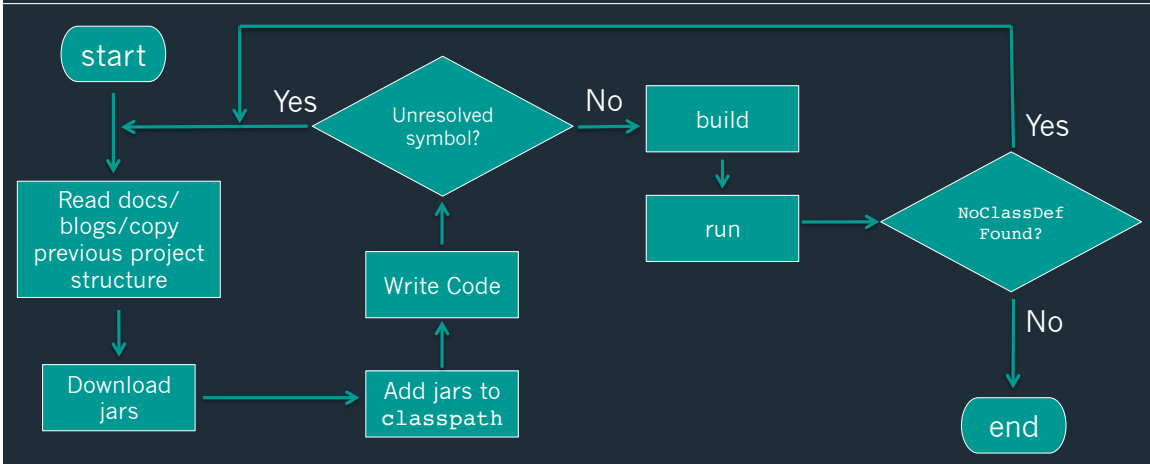
Resolving `Classpath` Hell



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Boilerplate code

Every application that accesses a relational database with `JDBC` needs to configure a `JdbcTemplate` and a `DataSource`

```
@Bean
public JdbcTemplate jdbcTemplate(
        DataSource dataSource) {
    return new JdbcTemplate(dataSource);
}
```

```
@Bean
public DataSource dataSource() {
    return new EmbeddedDatabaseBuilder()
            .setType(EmbeddedDatabaseType.H2)
            .addScripts("schema.sql", "data.sql")
            .build();
}
```

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Boilerplate code

To get a db connection

- Set Driver
- Set Connection URL
- Set Username
- Set Password
- Catch Exceptions

```
public static Connection getConnection() {
    if (dbConnection != null) {
        return dbConnection;
    } else {
        try {
            InputStream inputStream =
                    DbUtil.class.getClassLoader().
                    getResourceAsStream("db.properties");
            Properties properties = new Properties();
            if (properties != null) {
                properties.load(inputStream);

                String dbDriver = properties.getProperty("dbDriver");
                String connectionUrl = properties.getProperty("connectionUrl");
                String userName = properties.getProperty("userName");
                String password = properties.getProperty("password");

                Class.forName(dbDriver).newInstance();
                dbConnection = DriverManager.
                        getConnection(connectionUrl, userName, password);
            }
        } catch (Exception e) {
            e.printStackTrace();
        }
        return dbConnection;
    }
}
```


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Boilerplate code

For CRUD Operations

- Prepare Statement
- Set Parameters
- Execute Statement
- Catch Exceptions

```
public void save(String userName, String password, String firstName,
        String lastName, String dateOfBirth, String emailAddress) {
    try {
        PreparedStatement prepStatement = dbConnection.prepareStatement(
                "insert into student(userName, password, " +
        "firstName, lastName, dateOfBirth, emailAddress) " +
                        "values (?, ?, ?, ?, ?, ?)");
        prepStatement.setString(1, userName);
        prepStatement.setString(2, password);
        prepStatement.setString(3, firstName);
        prepStatement.setString(4, lastName);
        prepStatement.setDate(5, new java.sql.Date(
                new SimpleDateFormat("MM/dd/yyyy").
                parse(dateOfBirth.substring(0, 10)).getTime()));
        prepStatement.setString(6, emailAddress);

        prepStatement.executeUpdate();
    } catch (SQLException e) {
        e.printStackTrace();
    } catch (ParseException e) {
        e.printStackTrace();
    }
}
```


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Spring Boot

Spring Boot is an opinionated framework to simplify bootstrapping and development of new Spring Applications

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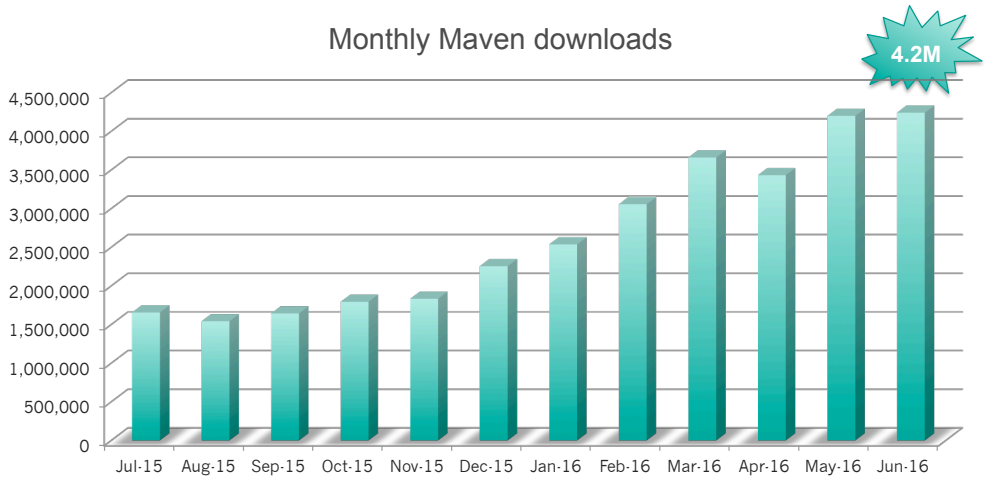
Spring Boot Adoption



Source: oss.sonatype.org

Agenda

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Capabilities

- Quick start project generation
- Automatic project dependency management
- Configuration drift prevention
- Conditional configuration

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Capabilities

- Developer Productivity Tooling
- Auto-configuration
- Monitoring and management endpoints
- Microservices-friendliness

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Spring Initializr

(Quick start project generation)

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Spring Initializer

Spring Initializr is a configurable service to consistently and easily generate a quick start project

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Spring Initializer

- 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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Spring Boot starters

(Automatic project dependency management)

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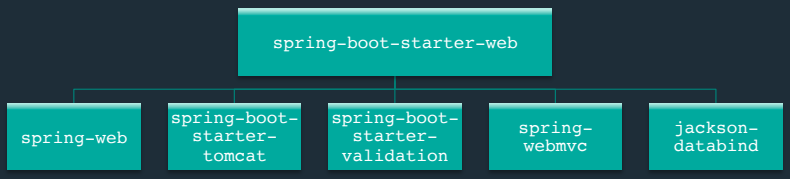
Spring Boot starters

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



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Profiles

(Conditional configuration)

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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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Profiles

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 the 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 the properties
    // file with spring.profile.active=production
    // command line with --spring.profiles.active=production
}
```

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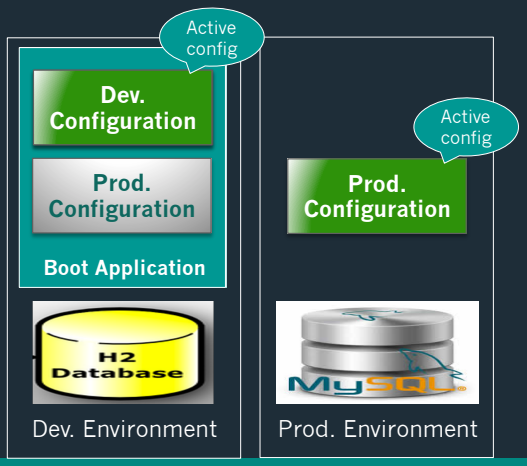
Profiles



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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Precedence of externalized configuration

1. Command line arguments.
2. Properties from `SPRING_APPLICATION_JSON` (inline JSON embedded in an environment variable or system property)
3. JNDI attributes from `java:comp/env`.
4. Java System properties (`System.getProperties()`).
5. OS environment variables.
6. A `RandomValuePropertySource` that only has properties in `random.*`.
7. Profile-specific application properties outside of your packaged jar (`application-{profile}.properties` and YAML variants)
8. Profile-specific application properties packaged inside your jar (`application-{profile}.properties` and YAML variants)
9. Application properties outside of your packaged jar (`application.properties` and YAML variants).
10. Application properties packaged inside your jar (`application.properties` and YAML variants).
11. `@PropertySource` annotations on your `@Configuration` classes.
12. Default properties (specified using `SpringApplication.setDefaultProperties`).

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Actuator

(Monitoring & Management Endpoints)

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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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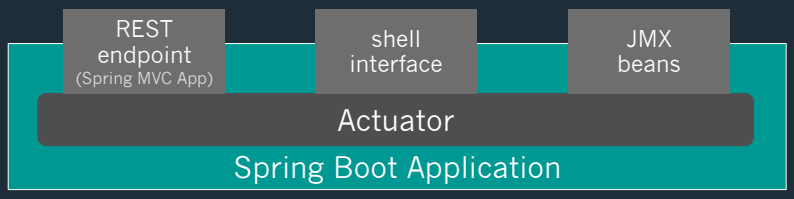
Actuator

Actuator Services are exposed through

- HTTP endpoints
- shell interface
- JMX Beans



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Types of Actuator Endpoints

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
- Plugin your own health definitions

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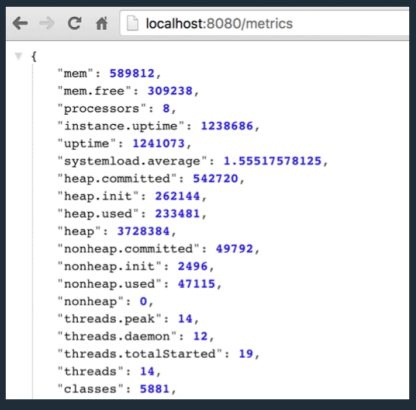
/metrics

Reports application metrics such as

- Memory usage and
- HTTP request counters



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Microservices

(Microservices-friendliness)

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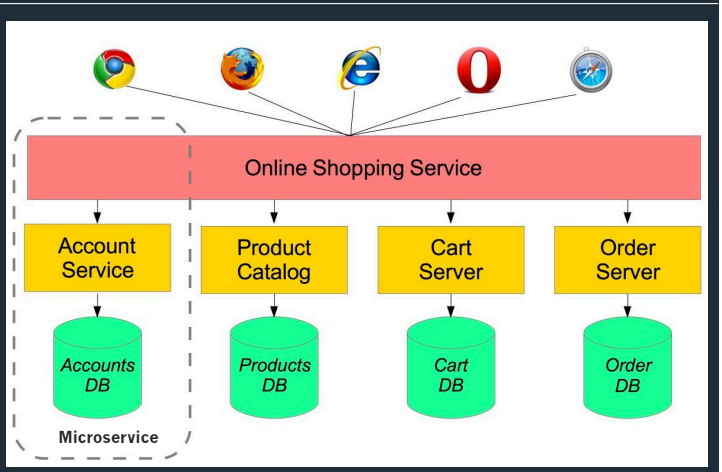
Microservices

Each microservice is a Spring Boot fat jar



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Thank You