**Spring Boot 参考指南**

1.5.8.RELEASE

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**第一部分. Spring Boot 文档**

本章节简要介绍Spring Boot参考文档。将其视为该文档的其余部分的地图。可以以线性方式阅读本参考文档，或者如果你不感兴趣，可以跳过本分内容。

# 关于文档

Spring Boot参考指南可作为html,pdf和epub文档。最新的副本可在官网获得。

本文件以副本可供自己使用，此类副本的额任何费用的情况下可以分发发给他人，，并进一步规定，不论是以书面形式还是以电子邮件方式分发，每个副本均包含本版权声明。

# 获取帮助

有关Spring Boot的问题，我们愿意提供帮助！

* [stackoverflow.com](http://stackoverflow.com/)
* [github.com/spring-projects/spring-boot/issues](https://github.com/spring-projects/spring-boot/issues).

# 第一步

如果你刚开始使用Spring Boot，或者通常是Spring，这是一个开始使用Spring Boot 的地方。

* **从头开始:** [概述](#_bookmark9) | [要求](#_bookmark10) | [安装](#_bookmark12)
* **教程:** [Part 1](#_bookmark24) | [Part 2](#_bookmark27)
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# 使用 Spring Boot

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* **附录:** [Application Properties](#_bookmark569) | [Auto-configuration classes](#_bookmark589) | [Executable Jars](#_bookmark593)

**第二部分. 入门**

如果你刚开始使用Spring Boot，或者一般来说就是Spring，那么这部分是你所需要了解的！在这里我们回答基本“what？”，“how?”,”why?”的问题。你会发现一个优美的介绍，以及安装说明。然后，我们将构建我们的第一个Spring Boot应用程序，并讨论一些核心原则。

# Spring Boot 介绍

Spring Boot 是你可以轻松创建单机的生产级别的基于Spring的可运行的应用程序。我们队Spring平台和第三方库有自己的一些做法，所以你可以从最小的功能开始。大多数Spring Boot 应用程序值需要很少的Spring配置。

你可以使用Spring Boot创建可以用java –jar或更传统的war部署来启动的应用程序。我们还提供了一个运行“spring scripts”的命令行工具。

我们的主要目标是：

* 为所有Spring开发提供一个更快，更广泛的入门体验。
* 开箱即用，但随着需求开始偏离默认值，快速开始。
* 提供大量项目(如嵌入式服务器，安全性，指标，运行状况检查，外部配置)通用的一些列非功能性功能。
* 绝对不生成代码，不需要XML配置

# 系统要求

默认情况下，Spring Boot1.5.8.RELEASE需要Java 7 和 Spring Framework 4.3.12.RELEASE或更高版本。你可以使用带有Java 6的Spring Boot以及其他一些配置。有关更多详细信息请参见84.11节如何使用Java 6 。Maven(3.2+)和Gradle 2(2.9或更高版本)和3提供了明确的构建支持。

**Tip**

虽然可以使用Java 6 或 7 的Spring Boot，但是我们通常推荐使用Java 8 。

## Servlet 容器

开箱即用支持一下嵌入式servlet容器:

|  |  |
| --- | --- |
| **Name** | **Servlet Version Java Version** |
| Tomcat 8  Tomcat 7 | 3.1 Java 7+  3.0 Java 6+ |
| Jetty 9.3 | 3.1 Java 8+ |
| Jetty 9.2 | 3.1 Java 7+ |
| Jetty 8 | 3.0 Java 6+ |
| Undertow 1.3 | 3.1 Java 7+ |

你也可以将Spring Boot应用程序部署到任何与Servlet 3.0+兼容的容器。

# 安装 Spring Boot

Spring Boot可以与经典Java开发工具一期使用，也可以作为命令行工具安装。无论如何，你将需要Java SDK V1.6 或更高版本。在空时之前，你应该检查你当前的Java安装:

$ java -version

如果你对Java开发不熟悉，或者你知识向尝试Spring Boot, 则可能需要先尝试Spring Boot CLI，否则请阅读[Spring Boot CLI](#_bookmark16) 安装说明。

**Tip**

尽管Spring Boot与Java 6兼容，但如果可能的话，应该考虑使用最新版本的Java

## Java开发人员的安装说明

你可以像使用任何标准Java库一样使用Spring Boot。只需要在你的类路径中包含相应的spring-boot.-\*.jar文件即可。Spring Boot不需要任何特殊的工具集成，所以可以使用任何IDE或文本编辑器;Spring Boot应用程序没有什么特别之处，所以你可以像运行其他Java程序一样运行和调试。

尽管你可以复制Spring Boot jars，但我们通常建议你使用支持依赖管理的构建工具(如Maven或Gradle)。

### Maven 安装

Spring Boot与Apache Maven3.2或更高版本兼容。如果你还没有安装maven，你可以按照[maven.apache.org](http://maven.apache.org/)上的说进行操作。

**Tip**

在许多操作系统上，maven可以通过包管理器来安装。如果你是OSX 用户，请尝试安装maven。ubuntu用于而已运行sudo apt-get install maven。

Spring Boot 依赖使用org.springframework.boot groupId。通常，你的maven POM文件将从spring-boot-starter-parent项目继承，并向一个或多个starter声明依赖关系。Spring Boot还提供一个可选的maven插件来创建可执行的jar文件。

这是一个典型的 pom.xml 文件:

<?xml version="1.0" encoding="UTF-8"?>

**<project xmlns**=[**"http://maven.apache.org/POM/4.0.0"**](http://maven.apache.org/POM/4.0.0) **xmlns:xsi**=[**"http://www.w3.org/2001/XMLSchema-instance"**](http://www.w3.org/2001/XMLSchema-instance) **xsi:schemaLocation**=[**"http://maven.apache.org/POM/4.0.0**](http://maven.apache.org/POM/4.0.0)[**http://maven.apache.org/xsd/maven-4.0.0.xsd"**](http://maven.apache.org/xsd/maven-4.0.0.xsd)**>**

**<modelVersion>**4.0.0**</modelVersion>**

**<groupId>**com.example**</groupId>**

**<artifactId>**myproject**</artifactId>**

**<version>**0.0.1-SNAPSHOT**</version>**

*<!-- Inherit defaults from Spring Boot -->*

**<parent>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-parent**</artifactId>**

**<version>**1.5.8.RELEASE**</version>**

**</parent>**

*<!-- Add typical dependencies for a web application -->*

**<dependencies>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-web**</artifactId>**

**</dependency>**

**</dependencies>**

*<!-- Package as an executable jar -->*

**<build>**

**<plugins>**

**<plugin>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-maven-plugin**</artifactId>**

**</plugin>**

**</plugins>**

**</build>**

**</project>**

**Tip**

spring-boot-starter-parent 是使用Spring Boot的好方法，但他可能并不适合所有的情况。有时呢可能需要从不同的父POM继承，或者你可能不喜欢我们的默认设置。有关使用import scope 的替代解决方案，请参考[POM的Spring Boot章节](#_bookmark39)

## 安装 Spring Boot CLI

Spring Boot CLI是一个命令行工具，可以使用它快速创建Spring原型。 它允许你运行Groovy脚本，这意味着你有一个数据的类Java语法，没有太多的样板代码。

你不需要使用CLI来使用Spring Boot，但它绝对是让Spring应用程序实现最快速快捷的方式。

### 手动安装

你可以从Spring软件存储库下载Spring CLI发行版：

* [spring-boot-cli-1.5.8.RELEASE-bin.zip](http://repo.spring.io/release/org/springframework/boot/spring-boot-cli/1.5.8.RELEASE/spring-boot-cli-1.5.8.RELEASE-bin.zip)
* [spring-boot-cli-1.5.8.RELEASE-bin.tar.gz](http://repo.spring.io/release/org/springframework/boot/spring-boot-cli/1.5.8.RELEASE/spring-boot-cli-1.5.8.RELEASE-bin.tar.gz)

最新版本 [snapshot distributions](http://repo.spring.io/snapshot/org/springframework/boot/spring-boot-cli/) 也是可以使用的。

下载之后，请按照解压缩归档中的[INSTALL.txt](https://raw.github.com/spring-projects/spring-boot/v1.5.8.RELEASE/spring-boot-cli/src/main/content/INSTALL.txt) 说明进行操作。总结：在.zip文件的bin目录下有一个spring脚本(用于Windows的spring.bat)，或可以使用带有.jar文件的java –jar(该脚本可以帮助你确保类路径设置正确)。

### 使用 SDKMAN安装!

SDKMAN!(软件开发工具包管理器)可用于管理各种二进制SDK的多个版本，包括Groovy和Spring Boot CLI。获取[SDKMAN](http://sdkman.io/)! 从sdkman.io安装Spring Boot。

$ sdk install springboot

$ spring --version

Spring Boot v1.5.8.RELEASE

如果你正在开发CLI的功能并希望轻松访问你刚刚构建的版本，请按照这些额外说明进行操作。

$ sdk install springboot dev /path/to/spring-boot/spring-boot-cli/target/spring-boot-cli-1.5.8.RELEASE- bin/spring-1.5.8.RELEASE/

$ sdk default springboot dev

$ spring --version

Spring CLI v1.5.8.RELEASE

这将安装一个名为dev实例的spring的本地实例。它指向你的目标构建位置，所以每次重建Spring Boot时，spring都是最新的。

你可以如下这样做::

$ sdk ls springboot

================================================================================

Available Springboot Versions

================================================================================

> + dev

\* 1.5.8.RELEASE

================================================================================

+ - local version

\* - installed

> - currently in use

================================================================================

### OSX Homebrew 安装

如果你在Mac上并使用Homebrew，则只需要安装Spring Boot CLI即可：

$ brew tap pivotal/tap

$ brew install springboot

Homebrew 将会将spring安装到 /usr/local/bin.

**Note**

如果你没有看到该公式，那么你的brew的安装可能会过期。值需要执行brew更新并重启。

### MacPorts 安装

如果你在Mac上并使用[MacPorts](http://www.macports.org/)，则只需安装Spring Boot CLI即可：

$ sudo port install spring-boot-cli

### 命令行完成

Spring Boot CLI提供了为[BASH](http://en.wikipedia.org/wiki/Bash_%28Unix_shell%29) 和[zsh](http://en.wikipedia.org/wiki/Zsh) shells命令完成脚本。你可以在任何shell中获取脚本(也称为spring)的源代码，或者将其放入个人或系统范围的bash完成初始化。在Debian系统上，系统范围的焦恩在/shell-completion/bash中，当一个新的shell启动时，该目录中的所有脚本都会被执行。要手动运行脚本，例如:如果你已经安装使用SDKMAN!

$ . ~/.sdkman/candidates/springboot/current/shell-completion/bash/spring

$ spring <HIT TAB HERE>

grab help jar run test version

**Note**

如果你使用Homebrew或MacPorts安装Spring Boot CLI，则命令行完成脚本会自动在您的shell中注册。

### 快速启动 Spring CLI 示例

这是一个非常建档的web应用程序，你可以使用它来测试你的安装。创建一个名为app.groovy的文件。

@RestController

**class** ThisWillActuallyRun {

@RequestMapping("/") String home() {

***"Hello World!"***

}

}

然后简单地从一个shell运行它：

$ spring run app.groovy

**Note**

首次运行应用程序需要一段时间，因为依赖关系将会被下载。后续运行将会更快。

在你喜欢的浏览器中打开localhost:8080 ，你应该看到下面的输出。

Hello World!

## 从早期版本的Spring Boot升级

如果你是从早期版本的Spring Boot进行升级，请查看[project wiki](https://github.com/spring-projects/spring-boot/wiki)发行说明。你会发现升级说明以及每个版本的新功能和指的注意功能列表。

要升级现有的CLI安装，请使用响应的package manager命令(如brew升级)，或者如果你手动安装了CLI，请按照标准说明(standard instructions)记住更新PATH环境变量以及删除所有旧的引用。

# 开发你的第一个Spring Boot 应用程序

我们用Java开发一个简单的“Hello World！”web应用程序，重点介绍Spring Boot的一些主要特性。我们将使用Maven来构建这个项目，因为大多说IDE都支持。

**Tip**

spring.io网站包含许多使用Spring Boot 的入门指南。如果你想解决一个待定的问题，现在哪里查看。

你可以通过转到[start.spring.io](https://start.spring.io/) 并从依赖关系搜索器中选择web starter来快速执行以下步骤。这将自动商城一个新的项目结构，以便你可以立即开始编码([start coding right away](#_bookmark27))。检查文档以获取更多详细信息([documentation for more details](https://github.com/spring-io/initializr))。

在开始之前，请打开终端，检查是否安装了Java和Maven的有效版本。

$ java -version

java version "1.7.0\_51"

Java(TM) SE Runtime Environment (build 1.7.0\_51-b13)

Java HotSpot(TM) 64-Bit Server VM (build 24.51-b03, mixed mode)

$ mvn -v

Apache Maven 3.2.3 (33f8c3e1027c3ddde99d3cdebad2656a31e8fdf4; 2014-08-11T13:58:10-07:00) Maven home: /Users/user/tools/apache-maven-3.1.1

Java version: 1.7.0\_51, vendor: Oracle Corporation

**Note**

此示例需要在自己的文件中创建。后续的说明嘉定你已经创建了一个合适的文件夹，并且它是你的当前目录。

## 创建 POM

我们需要从创建一个maven pom.xml文件开始。pom.xml是用来构建项目的配方。打开你喜欢的文本编辑器并添加一下内容。

<?xml version="1.0" encoding="UTF-8"?>

**<project xmlns**=[**"http://maven.apache.org/POM/4.0.0"**](http://maven.apache.org/POM/4.0.0) **xmlns:xsi**=[**"http://www.w3.org/2001/XMLSchema-instance"**](http://www.w3.org/2001/XMLSchema-instance) **xsi:schemaLocation**=[**"http://maven.apache.org/POM/4.0.0**](http://maven.apache.org/POM/4.0.0)[**http://maven.apache.org/xsd/maven-4.0.0.xsd"**](http://maven.apache.org/xsd/maven-4.0.0.xsd)**>**

**<modelVersion>**4.0.0**</modelVersion>**

**<groupId>**com.example**</groupId>**

**<artifactId>**myproject**</artifactId>**

**<version>**0.0.1-SNAPSHOT**</version>**

**<parent>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-parent**</artifactId>**

**<version>**1.5.8.RELEASE**</version>**

**</parent>**

*<!-- Additional lines to be added here... -->*

**</project>**

这应该给你一个工作的构建，你可以通过运行mvn(你可以忽略jar僵尸空的 – 没有内容被标记为包含警告)来测试它。

**Note**

此时，你可以将项目导入IDE(大多数现代Java IDE包含多maven的内置支持)。为了简单起见，我们将继续在这个例子中使用纯文本编辑器。

## 添加 classpath 依赖

Spring Boot 提供了许多“starters”，可以方便地将jar添加到你的classpath中。我们的示例应用程序已经在pom的父节点中使用了spring-boot-starter-parent。spring-boot-starter-parent是一个特别的启动器，提供了有用的maven默认值。它还提供了一个依赖管理部分，以便你可以省略版本标记获得“blessed”的依赖关系。

其他入门者知识提供开发特定类型的应用程序时可能需要的依赖关系。由于我们正在开发一个web应用程序，我们将添加一个spring-boot-start-web依赖项 – 但在此之前，让我们看看我们目前有什么。

.mvn 依赖项：tree命令打印项目依赖项的属性结构。

**<dependencies>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-web**</artifactId>**

**</dependency>**

**</dependencies>**

$ mvn dependency:tree

[INFO] com.example:myproject:jar:0.0.1-SNAPSHOT

你可以看到spring-boot-starter-parent本身不提供依赖关系。 让我们编辑我们的pom.xml，并在父节的下方添加spring-boot-starter-web依赖项：

如果再次运行mvn dependency：tree，则会看到现在还有许多附加依赖项，包括Tomcat Web服务器和Spring Boot本身。.

## 写 code

为了完成我们的应用程序，我们需要创建一个Java文件。 Maven默认会从src / main / java编译源代码，所以你需要创建这个文件夹结构，然后添加一个名为src / main / java / Example.java的文件：

**import** org.springframework.boot.\*;

**import** org.springframework.boot.autoconfigure.\*;

**import** org.springframework.stereotype.\*;

**import** org.springframework.web.bind.annotation.\*;

@RestController @EnableAutoConfiguration **public class** Example {

@RequestMapping("/") String home() {

**return *"Hello World!"***;

}

**public static void** main(String[] args) **throws** Exception { SpringApplication.run(Example.**class**, args);

}

}

虽然这里没有太多的代码，但还是有很多。 我们来看看重要的部分。

### @RestController 和 @RequestMapping 注解

我们的Example类的第一个注解是@RestController。 这被称为*stereotype注解*。 它为阅读代码提供了线索，对于Spring来说，这个类扮演着特定的角色。 在这种情况下，我们的类是一个web @Controller，所以Spring在处理传入的Web请求时会考虑它。

@RequestMapping注释提供了“路由”信息。 它告诉Spring，任何具有路径“/”的HTTP请求都应该映射到home方法。 @RestController注释告诉Spring将结果字符串直接返回给调用者。

**Tip**

@RestController和@RequestMapping注解是Spring MVC注释（它们不是Spring Boot特有的）。 有关更多详细信息，请参阅[MVC section](https://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#mvc)参考资料中的MVC部分。

### @EnableAutoConfiguration 注解

第二个类级注释是@EnableAutoConfiguration。 这个注解告诉Spring Boot根据你添加的jar依赖来“猜测”你将如何配置Spring。 由于spring-boot-starter-web添加了Tomcat和Spring MVC，所以自动配置会假定你正在开发一个Web应用程序并相应地设置Spring。

|  |
| --- |
| **Starters and Auto-Configuration**  自动配置旨在与“启动器”配合使用，但这两个概念并不直接相关。 您可以自由选择和选择初学者之外的jar依赖项，并且Spring Boot将尽其所能地自动配置您的应用程序。 |

### “main” 方法

我们的应用程序的最后一部分是主要的方法。 这只是一个遵循Java约定的应用程序入口点的标准方法。 我们的主要方法通过调用run来委托Spring Boot的SpringApplication类。 SpringApplication将引导我们的应用程序，从Spring开始，它将启动自动配置的Tomcat Web服务器。 我们需要将Example.class作为参数传递给run方法，以告知SpringApplication是Spring的主要组件。 args数组也被传递以暴露任何命令行参数。.

## 运行这个示例

在这一点上我们的应用程序应该工作 由于我们使用了spring-boot-starter-parent POM，所以我们有一个有用的运行目标，我们可以使用它来启动应用程序。 键入mvn spring-boot：run 运行以启动应用程序：

\_ \_

\_

.

$ mvn spring-boot:run

/\\ / '\_ \_ \_(\_)\_ \_ \ \ \ \ ( ( )\ | '\_ | '\_| | '\_ \/ \_` | \ \ \ \

\\/ )| |\_)| | | | | || (\_| | ) ) ) ) ' | | . |\_| |\_|\_| |\_\ , | / / / /

=========|\_|==============| /=/\_/\_/\_/

:: Spring Boot :: (v1.5.8.RELEASE)

....... . . .

....... . . . (log output here)

....... . . .

........ Started Example in 2.222 seconds (JVM running for 6.514)

如果你打开一个web浏览器到localhost：8080，你应该看到如下输出：

Hello World!

要正常退出应用程序点击ctrl-c。

## 创建一个可执行的 jar

让我们通过创建一个完全独立的可执行jar文件来完成我们的例子，我们可以在生产环境中运行它。 可执行jar（有时也称为“fat jars”）是包含您编译的类以及您的代码需要运行的所有jar依赖项的归档文件。

|  |
| --- |
| **Executable jars and Java**  Java不提供任何标准的方法来加载嵌套的jar文件（即jar文件本身包含在jar中）。 如果您正在分发自包含的应用程序，这可能会有问题。  为了解决这个问题，许多开发者使用“uber”jar。 “uber”jar只是将所有jar里的所有类打包成一个单一的档案。 这种方法的问题在于，很难在应用程序中看到实际使用的库。 如果在多个罐子中使用相同的文件名（但具有不同的内容），则也可能是有问题的。  Spring Boot采用了不同的方法，可以直接嵌入jar。 |

要创建一个可执行的jar文件，我们需要将spring-boot-maven-plugin添加到我们的pom.xml。 在依赖关系部分下面插入以下几行：

**<build>**

**<plugins>**

**<plugin>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-maven-plugin**</artifactId>**

**</plugin>**

**</plugins>**

**</build>**

**Note**

spring-boot-starter-parent POM包含<executions>配置来绑定重新打包目标。 如果您不使用父POM，则需要自行声明此配置。 有关详细信息，请参阅插件文档([plugin documentation](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/maven-plugin/usage.html) )。

保存你的pom.xml并从命令行运行mvn package：

$ mvn package

[INFO] Scanning for projects... [INFO]

[INFO] ------------------------------------------------------------------------

[INFO] Building myproject 0.0.1-SNAPSHOT

[INFO] ------------------------------------------------------------------------ [INFO] .... ..

[INFO] --- maven-jar-plugin:2.4:jar (default-jar) @ myproject ---

[INFO] Building jar: /Users/developer/example/spring-boot-example/target/myproject-0.0.1-SNAPSHOT.jar [INFO]

[INFO] --- spring-boot-maven-plugin:1.5.8.RELEASE:repackage (default) @ myproject --- [INFO] ------------------------------------------------------------------------ [INFO] BUILD SUCCESS

[INFO] ------------------------------------------------------------------------

如果您查看目标目录，则应该看到myproject-0.0.1-SNAPSHOT.jar。 该文件大小应该在10 MB左右。 如果你想偷看里面，你可以使用jar tvf：

$ jar tvf target/myproject-0.0.1-SNAPSHOT.jar

您还应该在目标目录中看到一个名为myproject-0.0.1-SNAPSHOT.jar.original的小得多的文件。 这是Maven在被Spring Boot重新包装之前创建的原始jar文件。

使用 java –jar 命 令 运 行 jj a r 文 件 。

/\\ / '\_ \_ \_(\_)\_ \_ \ \ \ \ ( ( )\ | '\_ | '\_| | '\_ \/ \_` | \ \ \ \

\\/ )| |\_)| | | | | || (\_| | ) ) ) ) ' | | . |\_| |\_|\_| |\_\ , | / / / /

=========|\_|==============| /=/\_/\_/\_/

:: Spring Boot :: (v1.5.8.RELEASE)

....... . . .

....... . . . (log output here)

....... . . .

........ Started Example in 2.536 seconds (JVM running for 2.864)

\_ \_

\_

.

$ java -jar target/myproject-0.0.1-SNAPSHOT.jar

像以前一样，要优雅地退出应用程序点击ctrl-c。

# 接下来读什么

希望本节为您提供了一些Spring Boot基础知识，并帮助您编写自己的应用程序。 如果您是面向任务的开发人员，则可能需要跳过[spring.io](https://spring.io/)，查看一些入门指南(getting started)，以解决具体的“如何使用Spring”问题; 我们也有Spring Boot特定( [*How-to*](#_bookmark438) )的操作指南文档。

Spring Boot版本([Spring Boot repository](http://github.com/spring-projects/spring-boot) )也有一些你可以运行的样本([bunch of samples](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples) )。 样本独立于代码的其余部分（也就是说，您不需要构建其余的代码来运行或使用样本）。

另外，下一个逻辑步骤是阅读[*Part III, “Using Spring Boot”*](#_bookmark34)。 如果你真的不耐烦，也可以跳过来阅读Spring Boot的特([*Spring Boot features*](#_bookmark85))。

**第三部分. 使用 Spring Boot**

本节将更详细地介绍如何使用Spring Boot。 它涵盖了构建系统，自动配置以及如何运行应用程序等主题。 我们还介绍了一些Spring Boot的最佳实践。 尽管Spring Boot没有什么特别的地方（它只是你可以使用的另一个库），但是有一些建议，如果遵循这些建议，将使开发过程变得更容易一些。

如果您刚刚开始使用Spring Boot，则可能需要先阅读[*Getting Started*](#_bookmark8) ，然后再深入本节。

# 构建 systems

强烈建议您选择支持依赖管理的构建系统([*dependency management*](#_bookmark36),)，并且可以使用发布到“Maven Central”存储库的工件。 我们建议您选择Maven或Gradle。 Spring Boot可以与其他构建系统（例如Ant）一起工作，但是它们不会得到特别好的支持。

## Dependency 管理

Spring Boot的每个发行版都提供了一个支持的依赖列表。 在实践中，您不需要为构建配置中的任何这些依赖项提供一个版本，因为Spring Boot正在为您进行管理。 当您升级Spring Boot本身时，这些依赖关系也将以一致的方式升级。

**Note**

如果您觉得有必要，您仍然可以指定一个版本并覆盖Spring Boot的建议。

策划的列表包含您可以使用Spring Boot的所有spring模块以及第三方库的精炼列表。 该列表可用作标准物料清单（[Bills of Materials (spring-boot-](#_bookmark39) [dependencies)](#_bookmark39) ，并且还提供[Maven](#_bookmark38) 和[Gradle](#_bookmark413) 的其他专用支持。

**Warning**

Spring Boot的每个版本都与Spring框架的基础版本相关联，所以我们

强烈建议您不要自行指定版本。

## Maven

Maven用户可以继承spring-boot-starter-parent项目以获得合理的默认值。 父项目提供以下功能：

* Java 1.6 作为默认的编译器级别
* UTF-8 源代码格式
* [Dependency Management section](#_bookmark36),，允许您省略继承自Spring-Boot-Dependency POM的通用依赖项的<version>标记。
* 智能 [resource filtering](https://maven.apache.org/plugins/maven-resources-plugin/examples/filter.html).
* 智能 plugin configuration ([exec plugin](http://www.mojohaus.org/exec-maven-plugin/), [surefire](http://maven.apache.org/surefire/maven-surefire-plugin/), [Git commit ID](https://github.com/ktoso/maven-git-commit-id-plugin), [shade](http://maven.apache.org/plugins/maven-shade-plugin/)).
* 智能 resource filtering for application.properties and application.yml 包括 profile-specific files (e.g. application-foo.properties and application-foo.yml)

最后一点：由于默认配置文件接受Spring样式占位符（$ {...}），Maven过滤被改为使用@ .. @占位符（您可以用Maven属性resource.delimiter覆盖）。

### 继承 starter parent

要将项目配置为从spring-boot-starter-parent继承，只需设置父项：

*<!-- Inherit defaults from Spring Boot -->*

**<parent>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-parent**</artifactId>**

**<version>**1.5.8.RELEASE**</version>**

**</parent>**

**Note**

您应该只需要在此依赖项上指定Spring Boot版本号。 如果您导入更多的启动器，则可以安全地省略版本号。

通过该设置，您还可以通过在自己的项目中重写属性来覆盖各个依赖项。 例如，要升级到另一个Spring Data发行版，您需要将以下内容添加到您的pom.xml中

**Tip**

**<properties>**

**<spring-data-releasetrain.version>**Fowler-SR2**</spring-data-releasetrain.version>**

**</properties>**

检查 [spring-boot-dependencies pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-dependencies/pom.xml) 以获取支持的列表。

### 使用没有父 POM 的 Spring Boot

不是每个人都喜欢从spring-boot-starter-parent POM继承。 你可能有你自己的企业标准的父母，你需要使用，或者你可能只是喜欢显式声明所有的Maven配置。

如果您不想使用spring-boot-starter-parent，那么仍然可以通过使用scope = import dependency来保留依赖关系管理（而不是插件管理）的。

**<dependencyManagement>**

**<dependencies>**

**<dependency>**

*<!-- Import dependency management from Spring Boot -->*

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-dependencies**</artifactId>**

**<version>**1.5.8.RELEASE**</version>**

**<type>**pom**</type>**

**<scope>**import**</scope>**

**</dependency>**

**</dependencies>**

**</dependencyManagement>**

如上所述，该设置不允许您使用属性覆盖单个依赖项。 为了达到同样的结果，你需要在spring-boot-dependencies条目之前在项目的dependencyManagement中添加一个条目。 例如，要升级到另一个Spring Data发行版，您需要将以下内容添加到您的pom.xml中。

**<dependencyManagement>**

**<dependencies>**

*<!-- Override Spring Data release train provided by Spring Boot -->*

**<dependency>**

**<groupId>**org.springframework.data**</groupId>**

**<artifactId>**spring-data-releasetrain**</artifactId>**

**<version>**Fowler-SR2**</version>**

**<scope>**import**</scope>**

**<type>**pom**</type>**

**</dependency>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-dependencies**</artifactId>**

**<version>**1.5.8.RELEASE**</version>**

**<type>**pom**</type>**

**<scope>**import**</scope>**

**</dependency>**

**</dependencies>**

**</dependencyManagement>**

**Note**

在上面的例子中，我们指定了一个BOM，但是任何依赖类型都可以被覆盖。

### 更改 Java 版本

spring-boot-starter-parent选择相当保守的Java兼容性。 如果您想遵循我们的建议并使用较新的Java版本，则可以添加一个java.version属性：

**<properties>**

**<java.version>**1.8**</java.version>**

**</properties>**

### 使用 Spring Boot Maven 插件

Spring Boot包含一个Maven插件，可以将项目打包为可执行的jar文件。 如果要使用它，请将插件添加到<plugins>部分

**<build>**

**<plugins>**

**<plugin>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-maven-plugin**</artifactId>**

**</plugin>**

**</plugins>**

**</build>**

**Note**

如果你使用Spring Boot starter parent pom POM，你只需要添加插件，除非你想改变在父代中定义的设置，否则不需要进行配置。

## Starters

Starters是一套方便的依赖描述符，可以包含在应用程序中。 您可以获得所需的所有Spring及相关技术的一站式服务，无需搜索示例代码，也不需要粘贴大量依赖描述符。 例如，如果你想开始使用Spring和JPA来访问数据库，只需在你的项目中加入spring-boot-starter-data-jpa依赖项，你就可以开始了。

初学者包含很多依赖项，您需要快速启动并运行一个项目，并使用一组支持的传递依赖项。

|  |
| --- |
| **What’s in a name**  所有官方首发者都遵循类似的命名模式; spring-boot-starter- \*，其中\*是特定类型的应用程序。 这种命名结构旨在帮助您找到启动器。 许多IDE中的Maven集成允许您按名称搜索依赖项。 例如，安装适当的Eclipse或STS插件后，只需在POM编辑器中点击ctrl-space并键入“spring-boot-starter”即可获得完整列表。  正如创建自己的启动器([Creating your own starter](#_bookmark292) )部分中所解释的，第三方启动器不应该以spring-boot为开始，因为它是为官方Spring Boot工件保留的。 acme的第三方初学者通常被命名为acme-spring-boot-starter。 |

下面的应用程序启动器是由Spring Boot提供的

org.springframework.boot group:

*Table 13.1. Spring Boot application starters*

|  |  |  |
| --- | --- | --- |
| **Name** | **Description** | **Pom** |
| spring-boot-starter | 核心启动器，包括自动启动器， | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter/pom.xml) |
|  | 配置支持，日志记录 |  |
|  | 和YAML |  |
| spring-boot-starter- activemq | 使用Apache ActiveMQ启动JMS消息传递 | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-activemq/pom.xml) |
| spring-boot-starter- amqp | 使用Spring AMQP和Rabbitmq | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-amqp/pom.xml) |
| spring-boot-starter-aop | 面向切面 | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-aop/pom.xml) |
|  | 用Spring AOP编程 |  |
|  | 和AspectJ |  |
| spring-boot-starter- | JMS消息传递 | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-artemis/pom.xml) |
| artemis | 使用Apache Artemis |  |

|  |  |  |
| --- | --- | --- |
| **Name** | **Description** | **Pom** |
| spring-boot-starter- | Starter for using Spring Batch | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-batch/pom.xml) |
| batch |  |  |
| spring-boot-starter- | Starter for using Spring | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-cache/pom.xml) |
| cache | Framework’s caching support |  |
| spring-boot-starter- cloud-connectors | Starter for using Spring Cloud Connectors which simplifies connecting to services in cloud platforms like Cloud Foundry and Heroku | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-cloud-connectors/pom.xml) |
| spring-boot-starter- data-cassandra | Starter for using Cassandra distributed database and Spring Data Cassandra | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-data-cassandra/pom.xml) |
| spring-boot-starter- data-couchbase | Starter for using Couchbase document-oriented database and Spring Data Couchbase | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-data-couchbase/pom.xml) |
| spring-boot-starter- data-elasticsearch | Starter for using Elasticsearch search and analytics engine and Spring Data Elasticsearch | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-data-elasticsearch/pom.xml) |
| spring-boot-starter- data-gemfire | Starter for using GemFire distributed data store and Spring Data GemFire | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-data-gemfire/pom.xml) |
| spring-boot-starter- | Starter for using Spring Data | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-data-jpa/pom.xml) |
| data-jpa | JPA with Hibernate |  |
| spring-boot-starter- | Starter for using Spring Data | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-data-ldap/pom.xml) |
| data-ldap | LDAP |  |
| spring-boot-starter- data-mongodb | Starter for using MongoDB document-oriented database and Spring Data MongoDB | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-data-mongodb/pom.xml) |
| spring-boot-starter- data-neo4j | Starter for using Neo4j graph database and Spring Data Neo4j | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-data-neo4j/pom.xml) |
| spring-boot-starter- data-redis | Starter for using Redis key- value data store with Spring Data Redis and the Jedis client | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-data-redis/pom.xml) |
| spring-boot-starter- data-rest | Starter for exposing Spring Data repositories over REST using Spring Data REST | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-data-rest/pom.xml) |
| spring-boot-starter- data-solr | Starter for using the Apache Solr search platform with Spring Data Solr | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-data-solr/pom.xml) |

|  |  |  |
| --- | --- | --- |
| **Name** | **Description** | **Pom** |
| spring-boot-starter- freemarker | Starter for building MVC web applications using FreeMarker views | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-freemarker/pom.xml) |
| spring-boot-starter- groovy-templates | Starter for building MVC web applications using Groovy Templates views | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-groovy-templates/pom.xml) |
| spring-boot-starter- hateoas | Starter for building hypermedia- [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-hateoas/pom.xml) based RESTful web application  with Spring MVC and Spring HATEOAS | |
| spring-boot-starter- integration | Starter for using Spring Integration | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-integration/pom.xml) |
| spring-boot-starter- jdbc | Starter for using JDBC with the [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-jdbc/pom.xml) Tomcat JDBC connection pool | |
| spring-boot-starter- | Starter for building RESTful | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-jersey/pom.xml) |
| jersey | web applications using JAX-RS | |
|  | and Jersey. An alternative to | |
|  | [spring-boot-starter-web](#_bookmark47) | |
| spring-boot-starter- | Starter for using jOOQ to | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-jooq/pom.xml) |
| jooq | access SQL databases. An | |
|  | alternative to [spring-boot-](#_bookmark45) | |
|  | [starter-data-jpa](#_bookmark45) or | |
|  | [spring-boot-starter-](#_bookmark46) | |
|  | [jdbc](#_bookmark46) | |
| spring-boot-starter- | Starter for JTA transactions | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-jta-atomikos/pom.xml) |
| jta-atomikos | using Atomikos | |
| spring-boot-starter- | Starter for JTA transactions | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-jta-bitronix/pom.xml) |
| jta-bitronix | using Bitronix | |
| spring-boot-starter- jta-narayana | Spring Boot Narayana JTA Starter | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-jta-narayana/pom.xml) |
| spring-boot-starter- mail | Starter for using Java Mail and Spring Framework’s email sending support | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-mail/pom.xml) |
| spring-boot-starter- mobile | Starter for building web applications using Spring Mobile | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-mobile/pom.xml) |
| spring-boot-starter- mustache | Starter for building MVC web applications using Mustache views | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-mustache/pom.xml) |

|  |  |  |
| --- | --- | --- |
| **Name** | **Description** | **Pom** |
| spring-boot-starter- | Starter for using Spring Security [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-security/pom.xml) | |
| security |  | |
| spring-boot-starter- | Starter for using Spring Social | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-social-facebook/pom.xml) |
| social-facebook | Facebook | |
| spring-boot-starter- | Stater for using Spring Social | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-social-linkedin/pom.xml) |
| social-linkedin | LinkedIn | |
| spring-boot-starter- | Starter for using Spring Social | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-social-twitter/pom.xml) |
| social-twitter | Twitter | |
| spring-boot-starter- | Starter for testing Spring Boot | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-test/pom.xml) |
| test | applications with libraries | |
|  | including JUnit, Hamcrest and | |
|  | Mockito | |
| spring-boot-starter- thymeleaf | Starter for building MVC web applications using Thymeleaf views | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-thymeleaf/pom.xml) |
| spring-boot-starter- validation | Starter for using Java Bean Validation with Hibernate Validator | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-validation/pom.xml) |
| spring-boot-starter-web | Starter for building web, including RESTful, applications using Spring MVC. Uses Tomcat as the default embedded container | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-web/pom.xml) |
| spring-boot-starter- web-services | Starter for using Spring Web Services | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-web-services/pom.xml) |
| spring-boot-starter- | Starter for building WebSocket [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-websocket/pom.xml) | |
| websocket | applications using Spring | |
|  | Framework’s WebSocket | |
|  | support | |

In addition to the application starters, the following starters can be used to add [*production ready*](#_bookmark297) features:

*Table 13.2. Spring Boot production starters*

|  |  |
| --- | --- |
| **Name**  spring-boot-starter- actuator | **Description Pom**  Starter for using Spring Boot’s [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-actuator/pom.xml) Actuator which provides  production ready features to help you monitor and manage your application |
| spring-boot-starter- remote-shell | Starter for using the CRaSH [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-remote-shell/pom.xml) remote shell to monitor and |

|  |  |
| --- | --- |
| **Name** | **Description Pom** |
|  | manage your application over SSH. Deprecated since 1.5 |

Finally, Spring Boot also includes some starters that can be used if you want to exclude or swap specific technical facets:

*Table 13.3. Spring Boot technical starters*

|  |  |  |
| --- | --- | --- |
| **Name** | **Description** | **Pom** |
| spring-boot-starter- jetty | Starter for using Jetty as the embedded servlet container. An alternative to [spring-boot-](#_bookmark49) [starter-tomcat](#_bookmark49) | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-jetty/pom.xml) |
| spring-boot-starter- log4j2 | Starter for using Log4j2 for logging. An alternative to | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-log4j2/pom.xml) |
|  | [spring-boot-starter-](#_bookmark48) [logging](#_bookmark48) | |
| spring-boot-starter- logging | Starter for logging using Logback. Default logging starter | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-logging/pom.xml) |
| spring-boot-starter- | Starter for using Tomcat as the | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-tomcat/pom.xml) |
| tomcat | embedded servlet container. | |
|  | Default servlet container starter | |
|  | used by [spring-boot-](#_bookmark47) | |
|  | [starter-web](#_bookmark47) | |
| spring-boot-starter- undertow | Starter for using Undertow as the embedded servlet container. An alternative to | [Pom](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-starters/spring-boot-starter-undertow/pom.xml) |
|  | [spring-boot-starter-](#_bookmark49) [tomcat](#_bookmark49) | |

**Tip**

有关其他社区贡献者的列表，请参阅GitHub上的spring-boot-starters模块中的[README file](https://github.com/spring-projects/spring-boot/tree/master/spring-boot-starters/README.adoc) 。

# 构建你的 code

Spring Boot不需要任何特定的代码布局，但是，有一些最佳实践可以提供帮助。

## 使用 默认的 package

当一个类不包含包声明时，它被认为是在“默认包”中。 通常不鼓励使用“默认软件包”，应该避免使用“默认软件包”。 对于使用@ComponentScan，@EntityScan或@SpringBootApplication注释的Spring Boot应用程序来说，这可能会导致特定的问题，因为每个jar的每个类都将被读取。

**Tip**

我们建议您遵循Java推荐的软件包命名约定，并使用反向域名（例如com.example.project）。

## 加载 main application class

我们通常建议您将主应用程序类放在其他类的根包中。 @EnableAutoConfiguration注释通常放在主类上，它隐式地为某些项目定义了一个基本的“搜索包”。 例如，如果您正在编写JPA应用程序，则@EnableAutoConfiguration注释类的包将用于搜索@Entity项目。

使用根包也允许使用@ComponentScan注释而不需要指定basePackage属性。 如果您的主类位于根包中，也可以使用@SpringBootApplication注释。

这是一个典型的布局：

com

+- example

+- myproject

+- Application.java

|

+- domain

| +- Customer.java

| +- CustomerRepository.java

|

+- service

| +- CustomerService.java

|

+- web

+- CustomerController.java

The Application.java file would declare the main method, along with the basic @Configuration.

**package** com.example.myproject;

**import** org.springframework.boot.SpringApplication;

**import** org.springframework.boot.autoconfigure.EnableAutoConfiguration;

**import** org.springframework.context.annotation.ComponentScan;

**import** org.springframework.context.annotation.Configuration;

@Configuration @EnableAutoConfiguration @ComponentScan

**public class** Application {

**public static void** main(String[] args) { SpringApplication.run(Application.**class**, args);

}

}

# 配置 classes

Spring Boot支持基于Java的配置。 虽然可以使用XML源调用SpringApplication.run（），但我们通常建议您的主要来源是@Configuration类。 通常，定义主要方法的类也是主要@Configuration的一个好选择。

**Tip**

在互联网上已经发布了许多使用XML配置的Spring配置示例。 如果可能，请始终尝试使用基于Java的等效配置。 搜索Enable\*注释可以是一个很好的起点。

## 导入其他配置类

你不需要把所有的@Configuration放到一个类中。 @Import注释可用于导入其他配置类。 或者，您可以使用@ComponentScan自动获取所有Spring组件，包括@Configuration类。.

## 导入 XML 配置

如果您绝对必须使用基于XML的配置，我们建议您仍以@Configuration类开头。 然后您可以使用额外的@ImportResource注解来加载XML配置文件。

# Auto-configuration

Spring Boot自动配置会尝试根据您添加的jar依赖项自动配置您的Spring应用程序。 例如，如果HSQLDB在您的类路径中，并且您没有手动配置任何数据库连接Bean，那么我们将自动配置一个内存数据库。

您需要通过添加@EnableAutoConfiguration或者选择加入自动配置

@SpringBootApplication 或 @Configuration 。.

**Tip**

您应该只添加一个@EnableAutoConfiguration注释。 我们通常建议您将其添加到您的主要@Configuration类。

## 主键替代 auto-configuration

自动配置是非侵入性的，在任何时候您都可以开始定义自己的配置来替换自动配置的特定部分。 例如，如果添加自己的DataSource bean，则默认的嵌入式数据库支持将退出。

如果您需要了解当前正在应用的自动配置，以及为什么使用--debug开关启动您的应用程序。 这将启用选择核心记录器的调试日志，并将自动配置报告记录到控制台。

## 禁用特定的 auto-configuration

如果您发现正在应用您不需要的特定自动配置类，则可以使用@EnableAutoConfiguration的exclude属性来禁用它们。

**import** org.springframework.boot.autoconfigure.\*; **import** org.springframework.boot.autoconfigure.jdbc.\*; **import** org.springframework.context.annotation.\*;

@Configuration @EnableAutoConfiguration(exclude={DataSourceAutoConfiguration.class}) **public class** MyConfiguration {

}

如果类不在类路径中，则可以使用注释的excludeName属性，并指定完全限定的名称。 最后，您还可以通过spring.autoconfigure.exclude属性来控制自动配置类的列表。

**Tip**

您可以在注释级别和使用属性中定义排除。

# Spring Beans 和依赖注入

您可以自由使用任何标准的Spring框架技术来定义您的bean及其注入的依赖关系。 为了简单起见，我们经常发现使用@ComponentScan来查找bean，并结合使用@Autowired构造函数注入效果很好。

如果按照上面的建议构建代码（在根包中定位应用程序类），则可以添加@ComponentScan而不带任何参数。 所有的应用程序组件（@Component，@Service，@Repository，@Controller等）都将被自动注册为Spring Bean。

这里是一个示例@Service Bean，它使用构造函数注入来获取所需的RiskAssessor bean。

**package** com.example.service;

**import** org.springframework.beans.factory.annotation.Autowired;

**import** org.springframework.stereotype.Service;

@Service

**public class** DatabaseAccountService **implements** AccountService {

**private final** RiskAssessor riskAssessor; @Autowired

**public** DatabaseAccountService(RiskAssessor riskAssessor) {

**this**.riskAssessor = riskAssessor;

}

*// ...*

}

而如果一个bean有一个构造函数，你可以省略@Autowired。

@Service

**public class** DatabaseAccountService **implements** AccountService {

**private final** RiskAssessor riskAssessor;

**public** DatabaseAccountService(RiskAssessor riskAssessor) {

**this**.riskAssessor = riskAssessor;

}

*// ...*

}

**Tip**

请注意，如何使用构造函数注入允许riskAssessor字段被标记为final，表明它不能被随后更改。

# 使用 @SpringBootApplication 注解

许多Spring Boot开发人员总是使用@Configuration，@EnableAutoConfiguration和@ComponentScan注解其主类。 由于这些注释经常一起使用（特别是如果您遵循以上最佳实践[best practices](#_bookmark50) ），Spring Boot提供了一种方便的@SpringBootApplication替代方法。

@SpringBootApplication注释等价于使用@Configuration，@EnableAutoConfiguration和@ComponentScan及其默认属性：

**package** com.example.myproject;

**import** org.springframework.boot.SpringApplication;

**import** org.springframework.boot.autoconfigure.SpringBootApplication;

@SpringBootApplication *// same as @Configuration @EnableAutoConfiguration @ComponentScan*

**public class** Application {

**public static void** main(String[] args) { SpringApplication.run(Application.**class**, args);

}

}

**Note**

@SpringBootApplication还提供为@EnableAutoConfiguration 和 @ComponentScan注解

别名定制的属性

# 运行你的应用程序

将应用程序打包为jar并使用嵌入式HTTP服务器的最大优点之一就是您可以像运行其他应用程序一样运行应用程序。 调试Spring Boot应用程序也很容易; 你不需要任何特殊的IDE插件或扩展。

**Note**

本节仅介绍基于jar的打包。如果您选择将应用程序打包为war文件，则应参考您的服务器和IDE文档。

## 从一个 IDE 运行

您可以从IDE运行Spring Boot应用程序作为简单的Java应用程序，但是，首先您需要导入项目。 导入步骤取决于您的IDE和构建系统。 大多数IDE可以直接导入Maven项目，例如Eclipse用户可以从File菜单中选择Import ...Existing Maven Projects。

如果不能直接将项目导入到IDE中，则可以使用构建插件生成IDE元数据。 Maven包含[Eclipse](http://maven.apache.org/plugins/maven-eclipse-plugin/) 和 [IDEA](http://maven.apache.org/plugins/maven-idea-plugin/)的插件; Gradle为各种IDE提供插件[various IDEs](https://docs.gradle.org/2.14.1/userguide/userguide.html).。

**Tip**

如果您不小心运行了两次Web应用程序，则会看到“端口已被使用”错误。 STS用户可以使用“重新启动”按钮而不是“运行”来确保关闭任何现有的实例。

## 打包运行应用程序

如果您使用Spring Boot Maven或Gradle插件创建可执行jar，则可以使用java -jar运行应用程序。 例如：

$ java -jar target/myproject-0.0.1-SNAPSHOT.jar

也可以运行打包的应用程序并启用远程调试支持。 这使您可以将调试器附加到打包的应用程序：

$ java -Xdebug -Xrunjdwp:server=y,transport=dt\_socket,address=8000,suspend=n \

-jar target/myproject-0.0.1-SNAPSHOT.jar

## 使用 Maven 插件

Spring Boot Maven插件包含一个可用于快速编译和运行应用程序的运行目标。 应用程序以分解形式运行，就像在IDE中一样。

$ mvn spring-boot:run

您可能还想使用有用的操作系统环境变量：

$ export MAVEN\_OPTS=-Xmx1024m -XX:MaxPermSize=128M

## 使用 Gradle 插件

Spring Boot Gradle插件还包含一个bootRun任务，可用于以分解形式运行您的应用程序。 无论何时导入spring-boot-gradle-plugin，都会添加bootRun任务：

$ gradle bootRun

您可能也想使用这个有用的操作系统环境变量：

$ export JAVA\_OPTS=-Xmx1024m -XX:MaxPermSize=128M

## 热部署

由于Spring Boot应用程序只是普通的Java应用程序，所以JVM热插拔应该是开箱即用的。 JVM热交换在某种程度上受限于它可以替换的字节码，为了获得更完整的解决方案，可以使用[JRebel](http://zeroturnaround.com/software/jrebel/) 或[Spring Loaded](https://github.com/spring-projects/spring-loaded) 项目。 spring-boot-devtools模块还包括对快速应用程序重新启动的支持。

有关详细信息，请参阅下面的第20章开发人员工具([Chapter 20, *Developer tools*](#_bookmark67) )部分和热插拔“操作方法”

([Hot swapping “How-to”](#_bookmark537) )。

# 开发者工具

Spring Boot包含一组额外的工具，可以使应用程序开发体验更愉快。 spring-boot-devtools模块可以包含在任何项目中以提供额外的开发时间功能。 要包含devtools支持，只需将模块依赖关系添加到您的构建：

**Maven.**

**<dependencies>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-devtools**</artifactId>**

**<optional>**true**</optional>**

**</dependency>**

**</dependencies>**

**Gradle.**

dependencies {

compile(***"org.springframework.boot:spring-boot-devtools"***)

}

**Note**

运行完整打包的应用程序时，开发人员工具会自动禁用 如果您的应用程序是使用java -jar启动的，或者如果它是使用特殊的类加载器启动的，那么它就被认为是“生产应用程序”。 将依赖关系标记为可选项是一种最佳实践，可以防止devtools通过项目传递到其他模块。 Gradle不支持可选的依赖关系，因此您可能希望在此期间看看[propdeps-plugin](https://github.com/spring-projects/gradle-plugins/tree/master/propdeps-plugin) 插件。

**Tip**

重新打包的档案在默认情况下不包含devtools。 如果您想使用某些远程devtools功能([certain remote devtools](#_bookmark79) [feature](#_bookmark79))，则需要禁用excludeDevtools构建属性以包含它。 该属性支持Maven和Gradle插件。

## 默认属性值

Spring Boot支持的一些库使用缓存来提高性能。 例如，模板引擎([template engines](#_bookmark138) )将缓存已编译的模板，以避免重复解析模板文件。 此外，Spring MVC可以在服务静态资源时将HTTP缓存头添加到响应中。

虽然缓存在生产中非常有益，但在开发过程中可能会产生反作用，使您无法看到应用程序中刚才所做的更改。 由于这个原因，spring-boot-devtools默认会禁用这些缓存选项。

缓存选项通常由您的application.properties文件中的设置进行配置。 例如，Thymeleaf提供了spring.thymeleaf.cache属性。 而不需要手动设置这些属性，spring-boot-devtools模块将自动应用合理的开发时间配置。

**Tip**

有关应用的属性的完整列表，请参阅[DevToolsPropertyDefaultsPostProcessor](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-devtools/src/main/java/org/springframework/boot/devtools/env/DevToolsPropertyDefaultsPostProcessor.java)。

## 自动重启

使用spring-boot-devtools的应用程序将在类路径上的文件发生更改时自动重启。 在IDE中工作时，这是一个非常有用的功能，因为它为代码更改提供了一个非常快速的反馈循环。 默认情况下，将监视指向文件夹的类路径中的任何条目以进行更改。 请注意，某些资源（如静态资产和视图模板）不需要重新启动应用程序(s [do not need to restart](#_bookmark71) [the application](#_bookmark71))。

|  |
| --- |
| **触发重启**  **由于DevTools监视类路径资源，触发重启的唯一方法是更新类路径。 导致类路径更新的方式取决于您使用的IDE。 在Eclipse中，保存修改后的文件将导致类路径更新并触发重启。 在IntelliJ IDEA中，构建项目（Build - > Make Project）将具有相同的效果。** |

**Note**

您也可以通过受支持的构建插件（即Maven和Gradle）启动您的应用程序，只要启用了分叉功能，因为DevTools需要隔离的应用程序类加载器才能正常运行。 当Gradle和Maven在类路径中检测到DevTools时，默认会这样做。

**Tip**

与LiveReload一起使用时，自动重新启动的效果非常好。 详情请参阅下文([See below](#_bookmark77) )。 如果使用JRebel，自动重新启动将被禁用，以支持动态类重新加载。 其他devtools功能（如LiveReload和属性覆盖）仍然可以使用。

**Note**

DevTools依靠应用程序上下文的关闭挂起在重新启动期间关闭它。 如果您禁用了关闭挂起（SpringApplication.setRegisterShutdownHook（false）），它将无法正常工作。

**Note**

当确定类路径上的条目在更改时会触发重新启动时，DevTools会自动忽略名为spring-boot，spring-boot-devtools，spring-boot-autoconfigure，spring-boot-actuator和spring-boot-starter的项目。

**Note**

DevTools需要自定义ApplicationContext使用的ResourceLoader：如果你的应用程序已经提供了一个，它将被打包。 不支持直接覆盖ApplicationContext上的getResource方法。

|  |
| --- |
| 重新启动vs重新加载  Spring Boot提供的重启技术通过使用两个类加载器来工作。 不改变的类（例如来自第三方jar的类）被加载到基类加载器中。 您正在开发的类将加载到重启类加载器中。 当应用程序重新启动时，重启classloader被丢弃，并创建一个新的。 这种方法意味着应用程序重新启动通常比“冷启动”快得多，因为基类加载器已经可用并且已经被填充了。  如果您发现重新启动对于您的应用程序来说不够快，或者遇到类加载问题，则可以考虑从ZeroTurnaround中重新加载技术，例如[JRebel](http://zeroturnaround.com/software/jrebel/) 。 这些工作通过重写类，因为他们被加载，使他们更容易重新加载。 [Spring](https://github.com/spring-projects/spring-loaded) [Loaded](https://github.com/spring-projects/spring-loaded)提供了另一种选择，但是它不支持许多框架，并且没有商业支持。 |

### 排除资源

某些资源不一定需要在更改时触发重新启动。 例如，Thymeleaf模板可以就地编辑。 默认情况下，更改/ META-INF / maven，/ META-INF / resources，/ resources，/ static，/ public或/ templates中的资源不会触发重新启动，但会触发实时重新加载([live reload](#_bookmark77))。 如果你想自定义这些排除，你可以使用spring.devtools.restart.exclude属性。 例如，要仅排除/ static和/ public，您可以设置以下内容：

spring.devtools.restart.exclude=static/\*\*,public/\*\*

**Tip**

如果你想保持这些默认值，并添加额外的排除，使用

spring.devtools.restart.additional-exclude属性。

### 监听额外的路径

您可能希望在更改不在类路径中的文件时重新启动或重新加载应用程序。 为此，请使用spring.devtools.restart.additional- paths属性来配置其他路径以监视更改。 您可以使用上述的spring.devtools.restart.exclude属性来控制额外路径[described above](#_bookmark71)下的更改是否会触发完全重新启动或仅实时重新加载[live reload](#_bookmark77).。

### 禁用重启

如果您不想使用重新启动功能，则可以使用spring.devtools.restart.enabled属性将其禁用。 在大多数情况下，你可以在你的application.properties中设置它（这将仍然初始化重启类加载器，但它不会监视文件的变化）。

如果您需要完全禁用重新启动支持，例如，因为它不适用于特定的库，则需要在调用SpringApplication.run（...）之前设置System属性。 例如

**public static void** main(String[] args) { System.setProperty(***"spring.devtools.restart.enabled"***, ***"false"***); SpringApplication.run(MyApp.**class**, args);

}

### 使用一个触发文件

如果您使用连续编译已更改文件的IDE，则可能只希望在特定时间触发重新启动。 要做到这一点，你可以使用“触发文件”，这是一个特殊的文件，当你想要实际触发重新启动检查时必须修改。 只更改文件会触发检查，只有Devtools检测到必须执行某些操作时才会重新启动。 触发文件可以手动更新，也可以通过IDE插件进行更新。

要使用触发器文件，请使用spring.devtools.restart.trigger-file属性。

**Tip**

您可能需要将spring.devtools.restart.trigger-file设置为全局设置([global setting](#_bookmark78) )，以便所有项目的行为方式相同。

### 自定义重启类 classloader

如上面的[Restart vs Reload](#_bookmark70)部分所述，重新启动功能是通过使用两个类加载器来实现的。 对于大多数应用程序来说，这种方法运行良好，但有时会导致类加载问题。

默认情况下，IDE中的任何打开的项目都将使用“重新启动”类加载器以及任何常规的加载器加载

.jar文件将使用“base”类加载器加载。 如果您使用多模块项目，而不是将每个模块导入到IDE中，

则可能需要自定义项目。 要做到这一点，你可以创建一个META-INF / spring-devtools.properties文件。

spring-devtools.properties文件可以包含restart.exclude。 和restart.include。 前缀属性。 include元素是应该被拉入到“重启”类加载器中的项目，排除元素是应该被下推到“基本”类加载器中的项目。 该属性的值是一个将应用于类路径的正则表达式模式。

例如:

**restart.exclude.companycommonlibs**=/mycorp-common-[\\w-]+\.jar **restart.include.projectcommon**=/mycorp-myproj-[\\w-]+\.jar

**Note**

所有的配置钥匙必须是唯一的。 只要属性以restart.include开头。 要么

restart.exclude。 这将被考虑。

**Tip**

所有类路径中的META-INF / spring-devtools.properties都将被加载。 您可以将文件打包到项目中，也可以打包到项目使用的库中。

### 已知限制

对于使用标准ObjectInputStream进行反序列化的对象，重新启动功能无法正常工作。 如果您需要反序列化数据，则可能需要将Spring的ConfigurableObjectInputStream与Thread.currentThread（）。getContextClassLoader（）一起使用。

不幸的是，有些第三方库反序列化，而不考虑上下文类加载器。 如果您发现这样的问题，您需要向原作者请求修复。

## 实时重新加载

spring-boot-devtools模块包含一个嵌入式LiveReload服务器，当资源发生变化时，可用于触发浏览器刷新。 LiveReload浏览器扩展可从[livereload.com](http://livereload.com/extensions/)的Chrome，Firefox和Safari免费获得。

如果您不想在应用程序运行时启动LiveReload服务器，则可以设置

spring.devtools.livereload.enabled属性为false。

**Note**

一次只能运行一个LiveReload服务器。 在开始您的应用程序之前，请确保没有其他LiveReload服务器正在运行。 如果您从IDE启动多个应用程序，则只有第一个应用程序支持LiveReload。

## 全局设置

您可以通过将一个名为.spring-boot- devtools.properties的文件添加到您的$ HOME文件夹来配置全局devtools设置（请注意文件名以“.”开头）。 添加到此文件的任何属性都将应用于使用devtools的计算机上的所有Spring Boot应用程序。 例如，要将重新启动配置为始终使用触发器文件([trigger file](#_bookmark74))，可以添加以下内容：

**~/.spring-boot-devtools.properties.**

**spring.devtools.reload.trigger-file**=.reloadtrigger

## 远程应用程序

Spring Boot开发人员工具不仅限于本地开发。 您还可以在远程运行应用程序时使用多个功能。 远程支持是可选的，为了启用它，您需要确保devtools包含在重新打包的归档中：

**<build>**

**<plugins>**

**<plugin>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-maven-plugin**</artifactId>**

**<configuration>**

**<excludeDevtools>**false**</excludeDevtools>**

**</configuration>**

**</plugin>**

**</plugins>**

**</build>**

然后你需要设置一个spring.devtools.remote.secret属性，例如

**spring.devtools.remote.secret**=mysecret

**Warning**

在远程应用程序上启用spring-boot-devtools存在安全风险。 您不应该在生产部署上启用支持。

远程devtools支持分两部分提供; 有一个接受连接的服务器端点以及您在IDE中运行的客户端应用程序。 当设置了spring.devtools.remote.secret属性时，服务器组件会自动启用。 客户端组件必须手动启动。

### 运行远程客户端应用程序

远程客户端应用程序旨在从您的IDE中运行。 您需要使用与您要连接的远程项目相同的类路径来运行org.springframework.boot.devtools.RemoteSpringApplication。 传递给应用程序的非选项参数应该是您要连接到的远程URL。

例如，如果您使用的是Eclipse或STS，并且您已经将一个名为my-app的项目部署到Cloud Foundry，则可以执行以下操作：

* 从“运行”菜单中选择“运行配置...”。
* 创建一个新的Java应用程序“启动配置”。
* 浏览我的应用程序项目。
* 使用org.springframework.boot.devtools.RemoteSpringApplication作为主类。
* 将https://myapp.cfapps.io添加到程序参数（或任何远程URL）。

正在运行的远程客户端将如下所示：

Started RemoteSpringApplication in 0.74 seconds (JVM running for 1.105)

:

main] o.s.b.devtools.RemoteSpringApplication

:

main] o.s.b.d.a.OptionalLiveReloadServer

2015-06-10 18:25:07.074 INFO 14938 --- [

LiveReload server is running on port 35729 2015-06-10 18:25:07.130 INFO 14938 --- [

Starting RemoteSpringApplication on pwmbp with PID 14938 (/Users/pwebb/projects/spring-boot/code/ spring-boot-devtools/target/classes started by pwebb in /Users/pwebb/projects/spring-boot/code/spring- boot-samples/spring-boot-sample-devtools)

2015-06-10 18:25:06.671 INFO 14938 --- [ main] s.c.a.AnnotationConfigApplicationContext : Refreshing org.springframework.context.annotation.AnnotationConfigApplicationContext@2a17b7b6: startup date [Wed Jun 10 18:25:06 PDT 2015]; root of context hierarchy

2015-06-10 18:25:07.043 WARN 14938 --- [ main] o.s.b.d.r.c.RemoteClientConfiguration : The

connection to http://localhost:8080 is insecure. You should use a URL starting with 'https://'.

main] o.s.b.devtools.RemoteSpringApplication :

2015-06-10 18:25:06.632 INFO 14938 --- [

' | | . |\_| |\_|\_| |\_\ , | |\_|\_\ |\_|\_|\_\ /\ \ |/ / / /

=========|\_|==============| /===================================/\_/\_/\_/

:: Spring Boot Remote :: 1.5.8.RELEASE

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**Note**

由于远程客户端使用与实际应用程序相同的类路径，因此可以直接读取应用程序属性。 这是如何读取spring.devtools.remote.secret属性并将其传递给服务器进行身份验证。

**Tip**

总是建议使用https：//作为连接协议，以便流量被加密，密码不能被拦截。

**Tip**

如果您需要使用代理来访问远程应用程序，请配置spring.devtools.remote.proxy.host和spring.devtools.remote.proxy.port属性。

### 远程更新

远程客户端将以与本地重启相同的方式监视您的应用程序类路径的更改。 任何更新的资源将被推送到远程应用程序，并（如果需要）触发重新启动。 如果您正在迭代使用您本地没有的云服务的功能，这可能会非常有帮助。 通常远程更新和重新启动比完整的重建和部署周期快得多。

**Note**

只有远程客户端正在运行时才监视文件。 如果在启动远程客户端之前更改文件，则不会将其推送到远程服务器。

### 远程调试隧道

Java远程调试在诊断远程应用程序的问题时非常有用。 不幸的是，当您的应用程序部署在数据中心之外时，并不总是可以启用远程调试。 如果您使用基于容器的技术（例如Docker），则远程调试也可能会非常棘手。

为了帮助解决这些限制，devtools支持通过HTTP隧道传输远程调试流量。 远程客户端在端口8000上提供本地服务器，您可以将其附加到远程调试器。 建立连接后，调试流量将通过HTTP发送到远程应用程序。 如果你想使用不同的端口，你可以使用spring.devtools.remote.debug.local-port属性。

您需要确保您的远程应用程序在启用远程调试的情况下启动。 这通常可以通过配置JAVA\_OPTS来实现。 例如，使用Cloud Foundry，您可以将以下内容添加到您的manifest.yml中：

*---*

**env**:

**JAVA\_OPTS**: ***"-Xdebug -Xrunjdwp:server=y,transport=dt\_socket,suspend=n"***

**Tip**

请注意，您不需要将address = NNNN选项传递给-Xrunjdwp。 如果省略，Java将简单地选取一个随机空闲端口。

**Note**

通过Internet调试远程服务可能会很慢，您可能需要增加IDE中的超时。 例如，在Eclipse中，您可以选择Java从首选项调试...并将调试器超时（ms）更改为更合适的值（在大多数情况下，60000可以正常工作）。

**Warning**

在IntelliJ IDEA中使用远程调试通道时，必须将所有断点配置为挂起线程而不是VM。 默认情况下，IntelliJ IDEA中的断点会挂起整个虚拟机，而不是挂起命中断点的线程。 这具有暂停管理远程调试通道的线程的不良副作用，导致您的调试会话冻结。 在IntelliJ IDEA中使用远程调试通道时，应将所有断点配置为挂起线程而不是VM。 请参阅[IDEA-165769](https://youtrack.jetbrains.com/issue/IDEA-165769) 了解更多详情。

# 打包生产环境中的应用程序

可执行的jar可用于生产部署。 由于它们是独立的，因此它们也非常适合基于云的部署。

对于额外的“生产就绪”功能，如健康，审计和度量REST或JMX端点; 考虑加入spring-boot-actuator执行器。 有关详细信息，请参见[*Part V, “Spring Boot Actuator: Production-*](#_bookmark297)[*ready features”*](#_bookmark297) for details。

# 接下来读什么

您现在应该对如何使用Spring Boot以及您应该遵循的一些最佳实践有很好的理解。 您现在可以继续深入了解特定的[*Spring Boot features*](#_bookmark85) ，或者可以跳过并阅读Spring Boot的“[production ready](#_bookmark297)”部分。

**Part IV. Spring Boot 特性**

本节将深入探讨Spring Boot的细节。 在这里，您可以了解要使用和定制的关键功能。 如果还没有，可能需要阅读[*Part II, “Getting started”*](#_bookmark8) *和* [*Part III, “Using Spring Boot”*](#_bookmark34) ，以便您了解基础知识。

# SpringApplication

SpringApplication类提供了一个方便的方法来引导将从main（）方法启动的Spring应用程序。 在很多情况下，你可以委托给静态的SpringApplication.run方法：

**public static void** main(String[] args) { SpringApplication.run(MySpringConfiguration.**class**, args);

}

当您的应用程序启动时，您应该看到类似于以下内容：

Started SampleApplication in 2.992 seconds (JVM running for 3.658)

:

main] o.s.b.s.app.SampleApplication

main] .t.TomcatEmbeddedServletContainerFactory :

2014-03-04 13:09:54.912 INFO 41370 --- [

Server initialized with port: 8080

2014-03-04 13:09:56.501 INFO 41370 --- [

Starting SampleApplication v0.1.0 on mycomputer with PID 56603 (/apps/myapp.jar started by pwebb) 2013-07-31 00:08:16.166 INFO 56603 --- [ main] ationConfigEmbeddedWebApplicationContext :

Refreshing org.springframework.boot.context.embedded.AnnotationConfigEmbeddedWebApplicationContext@6e5a8246:

startup date [Wed Jul 31 00:08:16 PDT 2013]; root of context hierarchy

:

main] o.s.b.s.app.SampleApplication

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\\/ )| |\_)| | | | | || (\_| | ) ) ) ) ' | | . |\_| |\_|\_| |\_\ , | / / / /

=========|\_|==============| /=/\_/\_/\_/

:: Spring Boot :: v1.5.8.RELEASE

2013-07-31 00:08:16.117 INFO 56603 --- [

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.

默认情况下会显示INFO日志消息，包括一些相关的启动详细信息，例如启动应用程序的用户。

## 启动失败

如果您的应用程序无法启动，已注册的FailureAnalyzers将有机会提供专门的错误消息和具体操作来解决问题。 例如，如果您在端口8080上启动Web应用程序，并且该端口已被使用，则应该看到类似于以下内容的内容：

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* APPLICATION FAILED TO START

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Description:

Embedded servlet container failed to start. Port 8080 was already in use. Action:

Identify and stop the process that's listening on port 8080 or configure this application to listen on another port.

**Note**

Spring Boot提供了大量的FailureAnalyzer实现，你可以很容易地添加你自己的([add your own](#_bookmark440))。

如果没有故障分析仪能够处理异常，您仍然可以显示完整的自动配置报告，以更好地了解出了什么问题。 所以你需要启用调试财产或启用调试日志记录

org.springframework.boot.autoconfigure.logging.AutoConfigurationReportLoggingInitialize

例如，如果使用java -jar运行应用程序，则可以按如下所示启用调试属性：

$ java -jar myproject-0.0.1-SNAPSHOT.jar --debug

## 自定义 the Banner

启动时打印的Banner可以通过将banner.txt文件添加到类路径中或通过将banner.location设置为该文件的位置来更改。 如果文件有一个不寻常的编码，你可以设置banner.charset（默认是UTF-8）。 除了文本文件之外，还可以将banner.gif，banner.jpg或banner.png图像文件添加到您的类路径中，或设置banner.image.location属性。 图像将被转换成ASCII艺术表现形式并打印在任何文字横幅上方。

在您的banner.txt文件中，您可以使用以下任何占位符：

*Table 23.1. Banner variables*

|  |  |
| --- | --- |
| **Variable** | **Description** |
| ${application.version} | The version number of your application as declared in MANIFEST.MF. For example Implementation-Version: 1.0 is printed as 1.0. |
| ${application.formatted-version} | The version number of your application as declared in MANIFEST.MF formatted for display (surrounded with brackets and prefixed with v). For example (v1.0). |
| ${spring-boot.version}  ${spring-boot.formatted-version} | The Spring Boot version that you are using. For example 1.5.8.RELEASE.  The Spring Boot version that you are using formatted for display (surrounded with brackets and prefixed with v). For example (v1.5.8.RELEASE). |
| ${Ansi.NAME} (or ${AnsiColor.NAME},  ${AnsiBackground.NAME},  ${AnsiStyle.NAME}) | Where NAME is the name of an ANSI escape code. See [AnsiPropertySource](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/ansi/AnsiPropertySource.java) for details. |
| ${application.title} | The title of your application as declared in MANIFEST.MF. For example  Implementation-Title: MyApp is printed  as MyApp. |

**Tip**

如果要以编程方式生成Banner，则可以使用SpringApplication.setBanner（...）方法。 使用org.springframework.boot.Banner接口并实现自己的printBanner（）方法。

您还可以使用spring.main.banner-mode属性来确定banner是否必须使用已配置的logger（log）或根本不打印（关闭）打印在System.out（控制台）上。

打印的banner将以springBootBanner名称注册为单例bean。

**Note**

YAML映射为false，因此如果要禁用应用程序中的banner，请确保添加引号。

**spring**:

**main**:

**banner-mode**: ***"off"***

## 自定义 SpringApplication

如果SpringApplication默认不符合您的喜好，您可以创建一个本地实例并对其进行自定义。 例如，要关闭横幅，你会写：

**public static void** main(String[] args) {

SpringApplication app = **new** SpringApplication(MySpringConfiguration.**class**); app.setBannerMode(Banner.Mode.OFF);

app.run(args);

}

**Note**

传递给SpringApplication的构造函数参数是spring bean的配置源。 在大多数情况下，这些将是对@Configuration类的引用，但也可能是对XML配置或应扫描的包的引用。

也可以使用application.properties文件来配置SpringApplication。 有关详细信息，请参阅第[*Chapter 24, Externalized Configuration*](#_bookmark97) 。

有关配置选项的完整列表，请参阅[SpringApplication Javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/SpringApplication.html)。

## Fluent builder API

如果您需要构建一个ApplicationContext层次结构（具有父/子关系的多个上下文），或者如果您只想使用“fluent”构建器API，则可以使用SpringApplicationBuilder。

SpringApplicationBuilder允许你链接多个方法调用，包括parent 和 child的方法，允许你创建一个层

次结构。

**new** SpringApplicationBuilder()

.sources(Parent.**class**)

.child(Application.**class**)

.bannerMode(Banner.Mode.OFF)

.run(args);

For example:

**Note**

创建ApplicationContext层次结构时有一些限制，例如 Web组件必须包含在child context，并且相同的环境将用于parent and child contexts。 有关完整的细节，请参阅[SpringApplicationBuilder Javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/builder/SpringApplicationBuilder.html) 。

## Application events and listeners

除了通常的Spring框架事件，比如[ContextRefreshedEvent](http://docs.spring.io/spring/docs/4.3.12.RELEASE/javadoc-api/org/springframework/context/event/ContextRefreshedEvent.html)，SpringApplication发送一些额外的应用

程序事件。

**Note**

有些事件实际上是在创建ApplicationContext之前触发的，因此您不能将这些监听器注册为@Bean。 您可以通过SpringApplication.addListeners（...）或SpringApplicationBuilder.listeners（...）方法注册它们。

如果您希望自动注册这些监听器而不管创建应用程序的方式如何，您可以将META-INF / spring.factories文件添加到您的项目中，并使用org.springframework.context.ApplicationListener项引用您的监听器。

org.springframework.context.ApplicationListener=com.example.project.MyListener

应用程序事件按照以下顺序发送，就像您的应用程序运行一样：

1. ApplicationStartingEvent在运行开始时发送，但在除监听器和初始化程序的注册之外的任何处理之前发送。
2. 当在上下文中使用的环境是已知的，但在上下文创建之前，发送plicationEnvironmentPreparedEvent。
3. 一个ApplicationPreparedEvent只在刷新开始之前发送，但是在bean定义被载入之后。
4. 刷新后发送ApplicationReadyEvent，并处理任何相关的回调以指示应用程序已准备好为请求提供服务。
5. 如果启动时出现异常，则发送ApplicationFailedEvent。

**Tip**

您通常不需要使用应用程序事件，但可以方便地知道它们存在。 在内部，Spring Boot使用事件来处理各种任务。

## Web environment

SpringApplication将会尝试为你创建正确类型的ApplicationContext。 默认情况下，将使用AnnotationConfigApplicationContext或AnnotationConfigEmbeddedWebApplicationContext，具体取决于您是否正在开发Web应用程序。

用于确定“Web环境”的算法相当简单（基于少数类的存在）。 如果您需要覆盖默认值，则可以使用setWebEnvironment（boolean webEnvironment）。

也可以通过调用setApplicationContextClass（...）来完全控制ApplicationContext类型。

**Tip**

使用SpringApplication时，通常需要调用setWebEnvironment（false）在JUnit测试中。

## 访问应用程序参数

如果您需要访问传递给SpringApplication.run的应用程序参数（...）你可以注入一个org.springframework.boot.ApplicationArguments bean。 ApplicationArguments接口提供对原始String []参数以及解析的选项和非选项参数的访问：

**import** org.springframework.boot.\*

**import** org.springframework.beans.factory.annotation.\*

**import** org.springframework.stereotype.\*

@Component

**public class** MyBean {

@Autowired

**public** MyBean(ApplicationArguments args) { **boolean** debug = args.containsOption(***"debug"***); List<String> files = args.getNonOptionArgs();

*// if run with "--debug logfile.txt" debug=true, files=["logfile.txt"]*

}

}

**Tip**

Spring Boot也将在Spring环境中注册一个CommandLinePropertySource。 这使您可以使用@Value注释来注入单个应用程序参数。

## 使用 ApplicationRunner 或 CommandLineRunner

如果你需要在SpringApplication启动后运行一些特定的代码，你可以实现ApplicationRunner或者CommandLineRunner接口。 两个接口都以相同的方式工作，并提供了一个将在SpringApplication.run（...）完成之前调用的单个运行方法。

CommandLineRunner接口作为一个简单的字符串数组提供对应用程序参数的访问，而ApplicationRunner使用上面讨论的ApplicationArguments接口。

**import** org.springframework.boot.\*

**import** org.springframework.stereotype.\*

@Component

**public class** MyBean **implements** CommandLineRunner {

**public void** run(String... args) {

*// Do something...*

}

}

还可以实现org.springframework.core.Ordered接口或使用org.springframework.core.annotation.Order注释，如果定义了多个CommandLineRunner或ApplicationRunner bean，则必须按特定顺序调用它们。

## 退出应用程序

每个SpringApplication都会向JVM注册一个shutdown hook，以确保ApplicationContext在退出时正常关闭。 所有标准的Spring生命周期回调（比如DisposableBean接口或者@PreDestroy注解）都可以使用。

另外，如果在调用SpringApplication.exit（）时想要返回特定的退出代码，那么，bean可以实现org.springframework.boot.ExitCodeGenerator接口来满足这个要求。 这个退出代码然后可以传递给System.exit（）以返回它作为状态代码。

@SpringBootApplication

**public class** ExitCodeApplication {

@Bean

**public** ExitCodeGenerator exitCodeGenerator() {

**return new** ExitCodeGenerator() { @Override

**public int** getExitCode() {

**return** 42;

}

};

}

**public static void** main(String[] args) { System.exit(SpringApplication

.exit(SpringApplication.run(ExitCodeApplication.**class**, args)));

}

}

另外，ExitCodeGenerator接口可能由异常实现。 遇到这样的异常时，Spring Boot将返回由实现的getExitCode（）方法提供的退出代码。

## Admin 功能

通过指定spring.application.admin.enabled属性，可以为应用程序启用与管理相关的功能。 这暴露了平台MBeanServer上的[SpringApplicationAdminMXBean](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/admin/SpringApplicationAdminMXBean.java) 。 您可以使用此功能远程管理您的Spring Boot应用程序。 这对于任何服务包装实现也是有用的。

**Tip**

如果您想知道应用程序在哪个HTTP端口上运行，请使用key获取该属性local.server.port。

**Note**

启用此功能时要小心，因为MBean公开了关闭应用程序的方法。

# 外部化配置

Spring Boot允许您将配置外部化，以便在不同的环境中使用相同的应用程序代码。 您可以使用属性文件，YAML文件，environment variables和command-line来外部化配置。 属性值可以使用@Value注解直接注入到bean中，可以通过Spring的Environment抽象来访问，也可以通过@ConfigurationProperties绑定到结构化对象([bound to](#_bookmark109) [structured objects](#_bookmark109) )。

Spring Boot使用了一个非常特殊的PropertySource命令，该命令旨在允许合理的重写值。 属性按以下顺序考虑：

1. 在您的主目录上开发[Devtools global settings properties](#_bookmark78)（当devtools处于活动状态时〜/ .spring-boot- devtools.properties）。
2. 测试中的[@TestPropertySource](http://docs.spring.io/spring/docs/4.3.12.RELEASE/javadoc-api/org/springframework/test/context/TestPropertySource.html) 注释.
3. 测试时[@[SpringBootTest#properties](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/test/context/SpringBootTest.html)](http://docs.spring.io/spring/docs/4.3.12.RELEASE/javadoc-api/org/springframework/test/context/TestPropertySource.html) 注释属性.
4. 命令行参数
5. 来自SPRING\_APPLICATION\_JSON的属性（嵌入在环境变量或系统属性中的内联JSON）
6. ServletConfig 初始化参数.
7. ServletContext 初始化参数.
8. 来自 java:comp/env JNDI 属性.
9. Java System properties (System.getProperties()).
10. OS 环境变量.
11. RandomValuePropertySource只具有随机的属性\*。
12. [Profile-specific application properties](#_bookmark101) outside of your packaged jar (application-

{profile}.properties and YAML variants)

1. [Profile-specific application properties](#_bookmark101) packaged inside your jar (application-

{profile}.properties and YAML variants)

1. Application properties outside of your packaged jar (application.properties and YAML variants).
2. Application properties packaged inside your jar (application.properties and YAML variants).
3. [@PropertySource](http://docs.spring.io/spring/docs/4.3.12.RELEASE/javadoc-api/org/springframework/context/annotation/PropertySource.html) annotations on your @Configuration classes.

17.Default properties (specified using SpringApplication.setDefaultProperties).

为了提供一个具体的例子，假设你开发了一个使用name属性的@Component：

**import** org.springframework.stereotype.\*

**import** org.springframework.beans.factory.annotation.\*

@Component

**public class** MyBean {

@Value("${name}")

**private** String name;

*// ...*

}

在您的应用程序类路径中（例如，在您的jar中），您可以拥有一个application.properties，为名称提供一个合理的默认属性值。 在新环境中运行时，可以在jar外部提供一个application.properties来覆盖名称; 对于一次性测试，您可以使用特定的命令行开关（例如java -jar app.jar - name =“Spring”）启动。

**Tip**

可以使用环境变量在命令行上提供SPRING\_APPLICATION\_JSON属性。 例如在一个UN \* X shell中：

$ SPRING\_APPLICATION\_JSON='{"foo":{"bar":"spam"}}' java -jar myapp.jar

在这个例子中，您将在Spring环境中以foo.bar = spam结尾。 您还可以在System变量中提供JSON作为spring.application.json：

$ java -Dspring.application.json='{"foo":"bar"}' -jar myapp.jar

或命令行参数：

$ java -jar myapp.jar --spring.application.json='{"foo":"bar"}'

或者作为JNDI变量java：comp / env / spring.application.json。

## 配置 random values

RandomValuePropertySource用于注入随机值（例如，注入秘密或测试用例）。 它可以产生integers，longs，uuids或strings，例如

**my.secret**=${random.value} **my.number**=${random.int} **my.bignumber**=${random.long} **my.uuid**=${random.uuid} **my.number.less.than.ten**=${random.int(10)} **my.number.in.range**=${random.int[1024,65536]}

random.int \*语法是OPEN value（，max）CLOSE其中OPEN，CLOSE是任何字符和值，max是整数。 如果提供最大值，则值是最小值，最大值是最大值（不包括）。

## 访问 command line properties

默认情况下，SpringApplication将转换任何命令行选项参数（以' -- '开头，例如 --server.port = 9000）添加到一个属性并将其添加到Spring环境。 如上所述，命令行属性总是优先于其他属性源。

如果您不希望将命令行属性添加到环境中，则可以使用禁用它们SpringApplication.setAddCommandLineProperties（false）。

## 应用程序 property files

SpringApplication将从以下位置的application.properties文件中加载属性，并将它们添加到Spring环境中：

1. 当前目录的A / config子目录.
2. 当前目录
3. 一个 classpath /config 包
4. classpath root

该列表按优先顺序排列（在列表中较高的位置定义的属性将覆盖在较低位置定义的属性）。

**Note**

您也可以使用[use YAML ('.yml') files](#_bookmark103) 文件替代“.properties”

如果您不喜欢application.properties作为配置文件名，则可以通过指定spring.config.name环境属性来切换到另一个。 您还可以使用spring.config.location环境属性（以逗号分隔的目录位置列表或文件路径）引用显式位置。

$ java -jar myproject.jar --spring.config.name=myproject

或

$ java -jar myproject.jar --spring.config.location=classpath:/default.properties,classpath:/ override.properties

**Warning**

spring.config.name和spring.config.location很早就用来确定哪些文件必须被加载，因此必须将其定义为环境属性（通常是OS env，系统属性或命令行参数）。

如果spring.config.location包含目录（而不是文件），它们应该以/结尾(并且会在加载之前附加从spring.config.name生成的名称，包括配置文件特定的文件名。) 在spring.config.location中指定的文件按原样使用，不支持特定于配置文件的变体，并且将被任何特定于配置文件的特性覆盖。

配置位置按相反顺序搜索。 默认情况下，配置的位置是classpath：/，classpath：/ config /，

file：. / file：./ config /。 结果搜索顺序是：

1. file:./config/
2. file:./
3. classpath:/config/
4. classpath:/

当配置自定义配置位置时，除了默认位置之外，还会使用它们。 在默认位置之前搜索自定义位置。 例如，如果配置了自定义位置classpath：/ custom-config /，file：./ custom-config /，则搜索顺序变为：

1. file:./custom-config/
2. classpath:custom-config/
3. file:./config/
4. file:./
5. classpath:/config/
6. classpath:/

此搜索顺序允许您在一个配置文件中指定默认值，然后在另一个配置文件中选择性地覆盖这些值。 您可以在默认位置之一的application.properties（或其他选择任何使用spring.config.name命名的）中为您的应用程序提供默认值。 这些默认值可以在运行时被置于其中一个自定义位置的不同文件覆盖。

**Note**

如果使用环境变量而非系统属性，则大多数操作系统不允许使用句点分隔的键名(period-separated key names)，但可以使用下划线（例如SPRING\_CONFIG\_NAME，而不是spring.config.name）。

**Note**

如果您正在容器中运行，那么可以使用JNDI属性（在java：comp / env中）或servlet上下文初始化参数，而不是使用环境变量或系统属性。

## Profile-specific properties

除了application.properties文件外，还可以使用命名约定application- {profile} .properties来定义特定于配置文件的属性。 如果没有设置活动配置文件（即，如果没有显式激活配置文件，则加载来自application-default.properties的属性），则环境具有一组默认配置文件（默认情况下为[缺省值]）。

Profile-specific properties 从标准application.properties的相同位置加载，配置文件特定的文件总是覆盖非特定的文件，而不管配置文件特定的文件是在打包的jar内部还是外部。

如果指定了多个配置文件，则应用最后一个赢取策略(last wins strategy applies)。 例如，由spring.profiles.active属性指定的配置文件会在通过SpringApplication API配置的配置文件之后添加，因此优先。

**Note**

如果您在spring.config.location中指定了任何文件，则不会考虑这些文件的特定于配置文件的变体。 如果您还想使用配置文件特定的属性，请使用spring.config.location中的目录。

## 属性中的占位符

application.properties中的值在使用时会通过现有的Environment进行过滤，因此您可以返回到以前定义的值（例如，从System properties）。

**app.name**=MyApp

**app.description**=${app.name} is a Spring Boot application

**Tip**

您也可以使用这种技术来创建现有Spring Boot属性的“short’”变体。 有关详细信息，请参见[*Section 72.4, “Use ‘short’ command line arguments”*](#_bookmark451) 。

## 使用 YAML 代替 Properties

[YAML](http://yaml.org/)是JSON的超集，因此是用于指定分层配置数据的非常方便的格式。 SpringApplication类将自动支持YAML作为属性的替代方法，只要在classpath中有[SnakeYAML](http://www.snakeyaml.org/) 库。

**Note**

如果您使用“Starters”，SnakeYAML将通过spring-boot-starter自动提供。

### 加载 YAML

Spring框架提供了两个方便的类，可以用来加载YAML文档。 YamlPropertiesFactoryBean将作为属性加载YAML，YamlMapFactoryBean将作为Map加载YAML。

例如，下面的YAML文件：

**environments**: **dev**:

**url**[: http://dev.bar.com](http://dev.bar.com/)

**name**: Developer Setup

**prod**:

**url**[: http://foo.bar.com](http://foo.bar.com/)

**name**: My Cool App

将被转化为这些属性：

**environments.dev.url**[=http://dev.bar.com](http://dev.bar.com/) **environments.dev.name**=Developer Setup **environments.prod.url**[=http://foo.bar.com](http://foo.bar.com/) **environments.prod.name**=My Cool App

YAML列表被表示为具有[index]解引用的属性键，例如这个YAML：

**my**:

**servers**:

* dev.bar.com
* foo.bar.com

将被转化为这些属性：

**my.servers[0]**=dev.bar.com **my.servers[1]**=foo.bar.com

要使用Spring DataBinder实用程序（这是@ConfigurationProperties所做的）绑定属性，需要在java.util.List（或Set）类型的目标Bean中拥有一个属性，并且您需要提供setter，或者 用一个可变的值初始化它，

例如 这将绑定到上面的属性

@ConfigurationProperties(prefix="my")

**public class** Config {

**private** List<String> servers = **new** ArrayList<String>();

**public** List<String> getServers() {

**return this**.servers;

}

}

**Note**

当按照您所期望的方式重写将无法正常工作时，需要额外的注意。 在上面的例子中，当my.servers被重新定义在几个地方时，单个元素是被覆盖的目标，而不是列表。 为了确保具有更高优先级的PropertySource可以覆盖列表，您需要将其定义为单个属性：

**my**:

**servers**: dev.bar.com,foo.bar.com

### 在Spring环境中将YAML作为属性公开

YamlPropertySourceLoader类可以用来在Spring环境中将YAML作为一个PropertySource公开。 这使您可以使用熟悉的@Value注释和占位符语法来访问YAML属性。

### Multi-profile YAML 文件

您可以使用spring.profiles在单个文件中指定多个特定于配置文件的YAML文档键来指示文件何时适用。

例如：

**server**:

**address**: 192.168.1.100

*---*

**spring**:

**profiles**: development

**server**:

**address**: 127.0.0.1

*---*

**spring**:

**profiles**: production

**server**:

**address**: 192.168.1.120

在上面的示例中，如果开发配置文件处于活动状态，则server.address属性将为127.0.0.1。 如果开发和生产配置文件未启用，则属性的值将是192.168.1.100。

如果在应用程序上下文启动时没有显式激活，则默认配置文件被激活。 所以在这个YAML中，我们设置了security.user.password的一个值，它只在“default”配置文件中可用：

**server**: **port**: 8000

*---*

**spring**:

**profiles**: default

**security**: **user**:

**password**: weak

而在这个例子中，密码总是被设置，因为它没有附加到任何配置文件，并且必须根据需要在所有其他配置文件中明确地重置:

**server**: **port**: 8000

**security**: **user**:

**password**: weak

使用“spring.profiles”元素指定的Spring配置文件可以有选择地使用！ 字符。 如果为单个文档指定了否定配置文件和非non-negated配置文件，则至少有一个非non-negated配置文件必须匹配，且non-negated配置文件可能不匹配。

### YAML 缺点

YAML文件不能通过@PropertySource注解加载。 所以在需要以这种方式加载值的情况下，您需要使用一个属性文件。

### Merging YAML lists

正如我们上面看到的([we have seen above](#_bookmark104))，任何YAML内容最终都会转换为属性。 当通过配置文件覆盖“列表”属性时，该过程可能不直观。

例如，假设名称和描述属性默认为空的MyPojo对象。 让我们从FooProperties公开一个MyPojo列表：

@ConfigurationProperties("foo")

**public class** FooProperties {

**private final** List<MyPojo> list = **new** ArrayList<>();

**public** List<MyPojo> getList() {

**return this**.list;

}

}

考虑以下配置：

**foo**:

**list**:

**- name**: my name

**description**: my description

*---*

**spring**: **profiles**: dev

**foo**:

**list**:

**- name**: my another name

如果开发者配置文件不活动，FooProperties.list将包含一个如上定义的MyPojo条目。 如果启用配置文件启用，但列表仍将只包含一个条目（名称“我的另一个名称”和说明空）。 此配置不会将第二个MyPojo实例添加到列表中，并且不会合并这些项目。

当在多个配置文件中指定一个集合时，将使用具有最高优先级的集合（并且仅使用该集合）：

**foo**:

**list**:

* **name**: my name

**description**: my description

* **name**: another name

**description**: another description

*---*

**spring**: **profiles**: dev

**foo**:

**list**:

**- name**: my another name

在上面的例子中，考虑到dev配置文件是活动的，FooProperties.list将包含一个MyPojo条目

（名称为“我的另一个名称”，说明为空）。

## Type-safe 配置文件

使用@Value（“$ {property}”）注释来注入配置属性有时会非常麻烦，特别是如果您使用多个属性或者您的数据是分层的。 Spring Boot提供了另一种处理属性的方法，允许强类型的bean管理和验证应用程序的配置。

**package** com.example;

**import** java.net.InetAddress; **import** java.util.ArrayList; **import** java.util.Collections; **import** java.util.List;

**import** org.springframework.boot.context.properties.ConfigurationProperties;

@ConfigurationProperties("foo")

**public class** FooProperties {

**private boolean** enabled;

**private** InetAddress remoteAddress;

**private final** Security security = **new** Security();

**public boolean** isEnabled() { ... }

**public void** setEnabled(**boolean** enabled) { ... }

**public** InetAddress getRemoteAddress() { ... }

**public void** setRemoteAddress(InetAddress remoteAddress) { ... }

**public** Security getSecurity() { ... }

**public static class** Security { **private** String username; **private** String password;

**private** List<String> roles = **new** ArrayList<>(Collections.singleton(***"USER"***));

**public** String getUsername() { ... }

**public void** setUsername(String username) { ... }

**public** String getPassword() { ... }

**public void** setPassword(String password) { ... }

**public** List<String> getRoles() { ... }

**public void** setRoles(List<String> roles) { ... }

}

}

上面的 POJO 定义了以下属性:

* foo.enabled, 默认为 false
* foo.remote-address, 与可以从String强制类型
* foo.security.username, 具有名称由属性名称确定的嵌套安全性。特别是返回类型没有在那里使用，可能是SecurityProperties
* foo.security.password
* foo.security.roles, 与String的集合

**Note**

getters和setter通常是强制的，因为绑定是通过标准的Java Beans属性描述符来完成的，就像在Spring MVC中一样。 有些情况下，可能会忽略setter:

* + Maps, 只要它们被初始化，就需要一个getter，但不一定是setter，因为它们可以被绑定器binder改变。
  + 集合和数组可以通过索引（通常使用YAML）或使用单个逗号分隔值（属性）来访问。 在后一种情况下，setter是强制性的。 我们建议始终为这种类型添加一个setter。 如果初始化一个集合，确保它不是不可变的（如上例）
  + 如果初始化嵌套的POJO属性（如上例中的Security域），则不需要setter。 如果您希望binder使用其默认构造函数即时创建实例，则需要一个setter。

有些人使用Project Lombok来自动添加getter和setter。 确保Lombok不会为这种类型生成任何特定的构造函数，因为它将被容器自动使用来实例化对象。

**Tip**

另外请参考 [differences between @Value and @ConfigurationProperties](#_bookmark114) 的区别.

您还需要列出要在@EnableConfigurationProperties中注册的属性类

注解：

@Configuration

@EnableConfigurationProperties(FooProperties.class)

**public class** MyConfiguration {

}

**Note**

当以这种方式注册@ConfigurationProperties bean时，该bean将具有常规名称：<prefix> - <fqn>，其中<prefix>是@ConfigurationProperties注释中指定的环境键前缀，<fqn>是 bean。 如果注释不提供任何前缀，则只使用bean的完全限定名称。

上例中的bean名称将是 foo-com.example.FooProperties.

即使上面的配置为FooProperties创建了一个常规的bean，我们也建议@ConfigurationProperties只处理环境，特别是不要从上下文中注入其他bean。 话虽如此，@EnableConfigurationProperties注释也会自动应用到您的项目中，以便任何现有的使用@ConfigurationProperties注释的bean都将从环境配置。 您可以通过确保FooProperties已经是一个bean来快速配置MyConfiguration：

@Component @ConfigurationProperties(prefix="foo") **public class** FooProperties {

*// ... see above*

}

SpringApplication外部YAML配置的这种配置特别适合：

*# application.yml*

**foo**:

**remote-address**: 192.168.1.1

**security**:

**username**: foo

**roles**:

* USER
* ADMIN

*# additional configuration as required*

要使用@ConfigurationProperties bean，您可以像其他任何bean一样注入它们。

@Service

**public class** MyService {

**private final** FooProperties properties; @Autowired

**public** MyService(FooProperties properties) {

**this**.properties = properties;

}

*//...*

@PostConstruct

**public void** openConnection() {

Server server = **new** Server(**this**.properties.getRemoteAddress());

*// ...*

}

}

**Tip**

使用@ConfigurationProperties还允许您生成元数据文件，IDE可以使用这些元数据文件为自己的密钥提供自动完成功能，详情请参阅附录B[Appendix B, *Configuration meta-*](#_bookmark571)[*data*](#_bookmark571) ，配置元数据附录。

### Third-party 配置

除了使用@ConfigurationProperties注解一个类，你也可以在public @Bean方法上使用它。 如果要将属性绑定到不受控制的第三方组件，这可能特别有用。

要从Environment属性配置一个bean，添加@ConfigurationProperties到它的bean注册：

@ConfigurationProperties(prefix = "bar") @Bean

**public** BarComponent barComponent() {

...

}

使用bar前缀定义的任何属性都将以类似于上面的FooProperties示例的方式映射到该BarComponent bean上。

### Relaxed binding

Spring Boot使用一些宽松的规则来将环境属性绑定到@ConfigurationProperties bean，所以不需要在Environment属性名称和bean属性名称之间完全匹配。 其中有用的常见示例包括虚线分隔（例如，上下文路径绑定到contextPath）和大写（例如PORT绑定到端口）环境属性。

例如，给定以下@ConfigurationProperties类：

@ConfigurationProperties(prefix="person")

**public class** OwnerProperties {

**private** String firstName;

**public** String getFirstName() {

**return this**.firstName;

}

**public void** setFirstName(String firstName) {

**this**.firstName = firstName;

}

}

以下属性名称都可以使用：

*Table 24.1. relaxed binding*

|  |
| --- |
| **Property Note** |
| person.firstNameStandard camel case syntax. |

|  |
| --- |
| **Property Note** |
| person.first- Dashed notation, recommended for use in .properties and .yml files.  name  person.first\_namUenderscore notation, alternative format for use in .properties and .yml  files. |
| PERSON\_FIRST\_NAMUEpper case format. Recommended when using a system environment variables. |

### Properties 转换

当它绑定到@ConfigurationProperties bean时，Spring将试图强制外部应用程序属性为正确的类型。 如果您需要自定义类型转换，您可以提供一个ConversionService bean（带有bean id conversionService）或自定义属性编辑器（通过CustomEditorConfigurer bean）或自定义Converters（注释为@ConfigurationPropertiesBinding的bean定义）。

**Note**

由于此bean在应用程序生命周期中很早被请求，因此请确保限制ConversionService所使用的依赖项。 通常情况下，您需要的任何依赖项可能在创建时未完全初始化。 如果不需要配置密钥强制转换，并且只依赖使用@ConfigurationPropertiesBinding限定的自定义转换器，则可能需要重命名自定义的ConversionService。

### @ConfigurationProperties 验证

当Spring的@Validated批注注释时，Spring Boot将尝试验证@ConfigurationProperties类。 您可以直接在您的配置类上使用JSR-303的javax.validation约束条件注释。 只要确保符合JSR-303的实现在您的类路径上，然后将约束注释添加到您的字段中：

@ConfigurationProperties(prefix="foo") @Validated

**public class** FooProperties {

@NotNull

**private** InetAddress remoteAddress;

*// ... getters and setters*

}

为了验证嵌套属性的值，您必须将相关字段注释为@Valid来触发其验证。 例如，建立在上面的FooProperties示例上：

@ConfigurationProperties(prefix="connection") @Validated

**public class** FooProperties {

@NotNull

**private** InetAddress remoteAddress;

@Valid

**private final** Security security = **new** Security();

*// ... getters and setters*

**public static class** Security { @NotEmpty

**public** String username;

*// ... getters and setters*

}

}

你也可以通过创建一个名为configurationPropertiesValidator的bean定义来添加一个自定义的Spring Validator。 应该声明@Bean方法是静态的。 配置属性验证器在应用程序生命周期的早期就被创建，并将@Bean方法声明为静态，这样就可以在不需要实例化@Configuration类的情况下创建bean。 这避免了可能由于实例化提前而导致的任何问题。 有一个属性验证示例[property validation sample](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-property-validation) ，所以你可以看到如何设置的东西。

**Tip**

spring-boot-actuator模块包含一个暴露所有@ConfigurationProperties bean的端点。 只需将您的Web浏览器指向/ configprops或使用等效的JMX端点即可。 请参阅生产准备功能[*Production ready features*](#_bookmark299)。 部分的细节。

### @ConfigurationProperties vs. @Value

@Value是核心容器功能，它不提供与类型安全配置属性相同的功能。 下表总结了@ConfigurationProperties和@Value支持的功能：

|  |  |
| --- | --- |
| **Feature @ConfigurationProp** | **@Value** |
| [Relaxed binding](#_bookmark111) Yes  [Meta-data support](#_bookmark571) Yes | No  No |
| SpEL evaluation No | Yes |

如果您为自己的组件定义了一组配置关键字，我们建议您将它们分组到POJO注释的@ConfigurationProperties中。 另请注意，由于@Value不支持放宽绑定，因此如果您需要使用环境变量提供值，则不是一个好选择。

最后，虽然可以在@Value中编写SpEL表达式，但是这些表达式不会从应用程序属性文件中处理[Application property files](#_bookmark100)。

# Profiles

Spring Profiles提供了一种分离部分应用程序配置的方法，并使其仅在特定环境中可用。 任何@Component或@Configuration都可以使用@Profile标签来限制何时加载:

在普通的Spring方法中，可以使用spring.profiles.active环境属性来指定哪些配置文件处于活动状态。 你可以用任何常用的方式来指定属性，例如你可以在你的application.properties中包含它：

**spring.profiles.active**=dev,hsqldb

或使用 switch --spring.profiles.active = dev，hsqldb在命令行中指定。

## 添加激活 profiles

spring.profiles.active属性遵循与其他属性相同的排序规则，最高的PropertySource将获胜。 这意味着您可以在application.properties中指定活动配置文件，然后使用命令行开关替换它们。

有时，将特定于配置文件的属性添加到活动配置文件而不是替换它们会很有用。 spring.profiles.include属性可以用来无条件添加活动配置文件。 SpringApplication入口点还有一个用于设置其他配置文件的Java API（即，在由spring.profiles.active属性激活的那些配置文件之上）：请参阅setAdditionalProfiles（）方法。

例如，当具有以下属性的应用程序使用switch - spring.profiles.active = prod运行时，proddb和prodmq配置文件也将被激活：

*---*

**my.property**: fromyamlfile

*---*

**spring.profiles**: prod

**spring.profiles.include**:

* proddb
* prodmq

**Note**

请记住，可以在YAML文档中定义spring.profiles属性，以确定何时将此特定文档包含在配置中。 有关更多详细信息，请参见[Section 72.7,](#_bookmark454) [“Change configuration depending on the environment”](#_bookmark454) 。

## 变成方式配置 profiles

您可以通过在应用程序运行之前调用SpringApplication.setAdditionalProfiles（...）以编程方式设置活动配置文件。 使用Spring的ConfigurableEnvironment接口也可以激活配置文件。

## Profile-specific configuration files

将application.properties（或application.yml）和通过@ConfigurationProperties引用的文件的特定于配置文件的变体(Profile-specific variants)视为加载文件。 有关详细信息，请参见[*Section 24.4,*](#_bookmark101)[*“Profile-specific properties”*](#_bookmark101) 。

# Logging

Spring Boot使用[Commons Logging](http://commons.apache.org/logging) 进行所有内部日志记录，但是将底层日志实现保留为打开状态。 为[Java Util Logging](http://docs.oracle.com/javase/7/docs/api/java/util/logging/package-summary.html), [Log4J2](http://logging.apache.org/log4j/2.x/) 和 [Logback](http://logback.qos.ch/)提供了默认配置。 在每种情况下，loggers都预先配置为使用控制台输出，可选的文件输出也可用。

默认情况下，如果使用“Starter”，Logback将用于日志记录。 还包括适当的Logback路由，以确保使用Java Util日志记录，Commons Logging，Log4J或SLF4J的相关库都能正常工作。

**Tip**

Java有很多可用的日志框架。 不要担心，如果上面的列表似乎令人困惑。 一般来说，你不需要改变你的日志依赖性，Spring Boot的默认设置就可以正常工作。

## Log 格式化

Spring Boot的默认日志输出如下所示：

:

:

:

:

2014-03-05 10:57:51.253 INFO 45469 --- [ost-startStop-1] o.a.c.c.C.[Tomcat].[localhost].[/] Initializing Spring embedded WebApplicationContext

2014-03-05 10:57:51.253 INFO 45469 --- [ost-startStop-1] o.s.web.context.ContextLoader Root WebApplicationContext: initialization completed in 1358 ms

2014-03-05 10:57:51.698 INFO 45469 --- [ost-startStop-1] o.s.b.c.e.ServletRegistrationBean Mapping servlet: 'dispatcherServlet' to [/]

2014-03-05 10:57:51.702 INFO 45469 --- [ost-startStop-1] o.s.b.c.embedded.FilterRegistrationBean

Mapping filter: 'hiddenHttpMethodFilter' to: [/\*]

main] org.apache.catalina.core.StandardEngine :

2014-03-05 10:57:51.112 INFO 45469 --- [

Starting Servlet Engine: Apache Tomcat/7.0.52

以下项目被输出：

* 日期和时间 - 精确到毫秒，易于排序。
* 日志级别 - 错误，警告，信息，调试或跟踪。
* Process ID.
* A ---分隔符来区分实际日志消息的开始。
* 线程名称 - 括在方括号中（可能会截断控制台输出）。
* Logger name — 这通常是源类名称（通常缩写）。
* log message.

**Note**

Logback没有FATAL级别（它被映射到ERROR）

## Console 输出

默认日志配置会在写入消息时将消息回送到控制台。 默认情况下会记录ERROR，WARN和INFO级别的消息。 您也可以通过使用--debug标志启动应用程序来启用“调试”模式。

$ java -jar myapp.jar --debug

**Note**

你也可以在你的application.properties中指定debug = true。

当启用调试模式时，会选择一些核心loggers（嵌入式容器，Hibernate和Spring Boot）来输出更多的信息。 启用调试模式不会将您的应用程序配置为使用DEBUG级别记录所有消息。

或者，您可以通过使用trace标志（或application.properties中的trace = true）启动应用程序来启用“跟踪”模式。 这将启用对核心记录器（嵌入式容器，Hibernate模式生成和整个Spring产品组合）选择的跟踪记录。

### Color-coded 输出

如果您的终端支持ANSI，则会使用彩色输出来提高可读性。 你可以设置spring.output.ansi.enabled为

[supported value](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/ansi/AnsiOutput.Enabled.html) 来覆盖自动检测。

颜色编码使用％clr转换字进行配置。 在最简单的形式中，转换器将根据日志级别为输出着色，例如：

%clr(%5p)

The mapping of log level to a color is as follows:

|  |  |
| --- | --- |
| **Level** | **Color** |
| FATAL | Red |
| ERROR | Red |
| WARN  INFO | Yellow  Green |
| DEBUG | Green |
| TRACE | Green |

或者，您可以通过提供转换选项来指定应使用的颜色或样式。 例如，要使文本变成黄色：

%clr(%d{yyyy-MM-dd HH:mm:ss.SSS}){yellow}

支持以下颜色和样式：

* blue
* cyan
* faint
* green
* magenta
* red
* yellow

## File output

默认情况下，Spring Boot将只能输出到控制台，不会写入日志文件。 如果除了控制台输出之外还想写日志文件，则需要设置logging.file或logging.path属性（例如，在application.properties中）。

下表显示了logging。\*属性如何一起使用：

*Table 26.1. Logging properties*

|  |  |  |
| --- | --- | --- |
| **logging.filleogging.path**  *(none) (none)* | **Example** | **Description**  Console only logging. |
| Specific file *(none)* | my.log | Writes to the specified log file. Names can be an exact location or relative to the current directory. |
| *(none)* Specific directory | /var/log | Writes spring.log to the specified directory. Names can be an exact location or relative to the current directory. |

日志文件在达到10 MB时会循环，并且与控制台输出一样，默认情况下会记录ERROR，WARN和INFO级别的消息。

**Note**

日志记录系统在应用程序生命周期的早期初始化，因此在通过@PropertySource注解加载的属性文件中不会找到这样的日志记录属性。

**Tip**

日志记录属性独立于实际的日志记录基础结构。 因此，特定的配置keys（例如Logback的logback.configurationFile）不受Spring Boot的管理。

## Log 级别

所有支持的日志记录系统都可以使用'logging.level.\* = LEVEL'在Spring Environment中设置日志级别（例如在application.properties中），其中LEVEL是TRACE，DEBUG，INFO，WARN，ERROR， FATAL，OFF之一 。 根记录器可以使用logging.level.root进行配置。 示例application.properties：

**logging.level.root**=WARN **logging.level.org.springframework.web**=DEBUG **logging.level.org.hibernate**=ERROR

**Note**

默认情况下，Spring Boot会重新映射Thymeleaf INFO消息，以便在DEBUG级别进行记录。 这有助于减少标准日志输出中的noise。 有关如何在自己的配置中应用重新映射的详细信息，请参阅[LevelRemappingAppender](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/logging/logback/LevelRemappingAppender.java)。

## 自定义日志配置

可以通过在类路径中包含适当的库来激活各种日志记录系统，并且可以通过在类路径的根目录中或在Spring环境属性logging.config中指定的位置提供合适的配置文件来进一步进行定制。

您可以使用org.springframework.boot.logging.LoggingSystem系统属性强制Spring Boot使用特定的日志记录系统。 该值应该是LoggingSystem实现的完全限定(fully-qualified)的类名称。 您还可以完全禁用Spring Boot的日志记录配置，使用值为none。

**Note**

由于在创建ApplicationContext之前对日志进行初始化，因此无法在Spring @Configuration文件中控制来自@PropertySources的日志记录。 系统属性和传统的Spring Boot外部配置文件工作得很好。）

根据您的日志记录系统，将加载以下文件：

|  |  |
| --- | --- |
| **Logging System** | **Customization** |
| Logback | logback-spring.xml, logback- spring.groovy, logback.xml or logback.groovy |
| Log4j2  JDK (Java Util Logging) | log4j2-spring.xml or log4j2.xml  logging.properties |

**Note**

如果可能，我们建议您使用-spring变体进行日志记录配置（例如，logback-spring.xml而不是logback.xml）。 如果使用标准配置位置，Spring将无法完全控制日志初始化。

**Warning**

Java Util Logging存在已知的类加载问题，从“executable jar”运行时会导致问题。 我们建议您尽可能避免。

为了帮助定制，一些其他的属性从Spring环境中传递

系统属性：

|  |  |
| --- | --- |
| **Spring Environment**  logging.exception- conversion-word | **System Property Comments**  LOG\_EXCEPTION\_CONVERSION\_WTOhReDconversion word that’s  used when logging exceptions. |
| logging.file | LOG\_FILE Used in default log configuration if defined. |

|  |  |  |
| --- | --- | --- |
| **Spring Environment** | **System Property** | **Comments** |
| logging.path  logging.pattern.console | LOG\_PATH  CONSOLE\_LOG\_PATTERN | Used in default log configuration if defined.  The log pattern to use on the console (stdout). (Only supported with the default logback setup.) |
| logging.pattern.file  logging.pattern.level | FILE\_LOG\_PATTERN  LOG\_LEVEL\_PATTERN | The log pattern to use in a file (if LOG\_FILE enabled). (Only supported with the default logback setup.)  The format to use to render the log level (default %5p).  (Only supported with the default  logback setup.) |
| PID | PID | The current process ID (discovered if possible and when not already defined as an OS environment variable). |

所有支持的日志系统在解析其配置文件时都可以查询系统属性。 有关示例，请参阅spring-boot.jar中的默认配置。

**Tip**

如果您想在日志记录属性中使用占位符，则应该使用Spring Boot的语法，而不是基础框架的语法。 值得注意的是，如果您使用的是Logback，则应该使用：作为属性名称和其默认值之间的分隔符，而不是： -

**Tip**

您可以通过仅覆盖LOG\_LEVEL\_PATTERN（或使用Logback的logging.pattern.level）来向日志行添加MDC和其他临时内容。 例如，如果使用logging.pattern.level = user：％X {user}％5p，则默认日志格式将包含“user”的MDC条目（如果存在）。

2015-09-30 12:30:04.031 user:juergen INFO 22174 --- [ nio-8080-exec-0] demo.Controller Handling authenticated request

## Logback 扩展

Spring Boot包含许多对Logback的扩展，可以帮助进行高级配置。 您可以在您的logback-spring.xml配置文件中使用这些扩展。

**Note**

您不能在标准logback.xml配置文件中使用扩展，因为它太早加载。 您需要使用logback-spring.xml或定义logging.config属性。

**Warning**

这些扩展名不能用于Logback的配置扫描([configuration scanning](http://logback.qos.ch/manual/configuration.html#autoScan))。 如果您尝试这样做，则更改配置文件将导致类似于以下记录之一的错误：

ERROR in ch.qos.logback.core.joran.spi.Interpreter@4:71 - no applicable action for [springProperty], current ElementPath is [[configuration][springProperty]]

ERROR in ch.qos.logback.core.joran.spi.Interpreter@4:71 - no applicable action for [springProfile], current ElementPath is [[configuration][springProfile]]

### Profile-specific configuration

<springProfile>标签允许您根据活动的Spring配置文件选择性地包含或排除配置的各个部分。 配置文件部分在<configuration>元素的任何地方都受支持。 使用name属性来指定哪个配置文件接受配置。 可以使用逗号分隔列表指定多个配置文件。

**<springProfile name**=**"staging">**

*<!-- configuration to be enabled when the "staging" profile is active -->*

**</springProfile>**

**<springProfile name**=**"dev, staging">**

*<!-- configuration to be enabled when the "dev" or "staging" profiles are active -->*

**</springProfile>**

**<springProfile name**=**"!production">**

*<!-- configuration to be enabled when the "production" profile is not active -->*

**</springProfile>**

### Environment properties

<springProperty>标签允许您在Spring环境中使用Spring环境的属性。 如果要在您的logback配置中访问您的application.properties文件中的值，这可能很有用。 该标签的工作方式与Logback的标准<property>标签类似，但不是指定直接值，而是指定属性的来源（来自环境）。 如果需要将属性存储在本地范围以外的地方，可以使用scope属性。 如果您在环境中未设置属性的情况下需要回退值，则可以使用defaultValue属性。

**<springProperty scope**=**"context" name**=**"fluentHost" source**=**"myapp.fluentd.host" defaultValue**=**"localhost"/>**

**<appender name**=**"FLUENT" class**=**"ch.qos.logback.more.appenders.DataFluentAppender">**

**<remoteHost>**${fluentHost}**</remoteHost>**

...

**</appender>**

**Tip**

RelaxedPropertyResolver用于访问环境属性。 如果以虚线符号（my-property-name）指定源，则会尝试所有宽松的变体(relaxed variations)（myPropertyName，MY\_PROPERTY\_NAME等）。

# 开发 web 应用程序

Spring Boot非常适合Web应用程序的开发。 您可以使用嵌入式Tomcat，Jetty或Undertow轻松创建自包含的HTTP服务器。 大多数Web应用程序将使用spring-boot-starter-web模块来快速启动和运行。

如果您还没有开发Spring Boot Web应用程序，则可以按照“Hello World！”进行操作。 Getting started。

## ‘Spring Web MVC framework’

Spring Web MVC框架（通常简称为“Spring MVC”）是一个丰富的“模型视图控制器”Web框架。 Spring MVC允许您创建特殊的@Controller或@RestController bean来处理传入的HTTP请求。 您的控制器中的方法使用@RequestMapping注释映射到HTTP。

这里是一个典型的例子@RestController来提供JSON数据：

@RestController @RequestMapping(value="/users") **public class** MyRestController {

@RequestMapping(value="/{user}", method=RequestMethod.GET)

**public** User getUser(@PathVariable Long user) {

*// ...*

}

@RequestMapping(value="/{user}/customers", method=RequestMethod.GET) List<Customer> getUserCustomers(@PathVariable Long user) {

*// ...*

}

@RequestMapping(value="/{user}", method=RequestMethod.DELETE)

**public** User deleteUser(@PathVariable Long user) {

*// ...*

}

}

Spring MVC是核心Spring框架的一部分，详细信息见参考[reference](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle#mvc) [documentation](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle#mvc)。 在[spring.io/guides](http://spring.io/guides) 中也有几个指南，涵盖了Spring MVC。

### Spring MVC auto-configuration

Spring Boot为Spring MVC提供了自动配置，可以与大多数应用程序配合使用。 自动配置在Spring的默认设置之上添加以下功能：

* 包含ContentNegotiatingViewResolver和BeanNameViewResolver bean。
* 支持提供静态资源，包括对WebJars的支持（见下文）。
* 自动注册Converter，GenericConverter，Formatter bean。
* 支持HttpMessageConverters（见下文）。
* 自动注册MessageCodesResolver（见下文）。
* 静态index.html支持。
* 自定义Favicon支持（见下文）。
* 自动使用可配置的WebBindingInitializer bean（见下文）。

如果你想保持Spring Boot MVC的功能，并且你只是想添加额外的[MVC](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle#mvc) [configuration](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle#mvc) （拦截器，格式化器，视图控制器等），你可以添加你自己的@Configuration类型的WebMvcConfigurerAdapter，但是没有@EnableWebMvc。 如果您希望提供RequestMappingHandlerMapping，RequestMappingHandlerAdapter或ExceptionHandlerExceptionResolver的自定义实例，则可以声明提供此类组件的WebMvcRegistrationsAdapter实例。

如果你想完全控制Spring MVC，你可以添加你自己的用@EnableWebMvc注解的@Configuration。

### HttpMessageConverters

Spring MVC使用HttpMessageConverter接口来转换HTTP请求和响应。 明智的默认是包括在盒子，例如对象可以自动转换为JSON（使用Jackson）或XML（使用Jackson XML扩展如果可用，否则使用JAXB）。 字符串默认使用UTF-8编码。

如果你需要添加或定制转换器，你可以使用Spring Boot的HttpMessageConverters

类：

**import** org.springframework.boot.autoconfigure.web.HttpMessageConverters;

**import** org.springframework.context.annotation.\*;

**import** org.springframework.http.converter.\*;

@Configuration

**public class** MyConfiguration {

@Bean

**public** HttpMessageConverters customConverters() { HttpMessageConverter<?> additional = ...

HttpMessageConverter<?> another = ...

**return new** HttpMessageConverters(additional, another);

}

}

存在于上下文中的任何HttpMessageConverter bean将被添加到转换器列表中。 您也可以通过这种方式覆盖默认转换器。

### 自定义JSON序列化器和反序列化器

如果您使用Jackson来序列化和反序列化JSON数据，则可能需要编写自己的JsonSerializer和JsonDeserializer类。 自定义序列化器通常通过[registered with](http://wiki.fasterxml.com/JacksonHowToCustomDeserializers) [Jackson via a Module](http://wiki.fasterxml.com/JacksonHowToCustomDeserializers)，但Spring Boot提供了一个替代的@JsonComponent注释，这使得更容易直接注册Spring Bean。

您可以直接在JsonSerializer或JsonDeserializer实现上使用@JsonComponent。 您也可以在包含序列化器/反序列化器的类中使用它作为内部类。 例如：

**import** java.io.\*;

**import** com.fasterxml.jackson.core.\*;

**import** com.fasterxml.jackson.databind.\*;

**import** org.springframework.boot.jackson.\*;

@JsonComponent

**public class** Example {

**public static class** Serializer **extends** JsonSerializer<SomeObject> {

*// ...*

}

**public static class** Deserializer **extends** JsonDeserializer<SomeObject> {

*// ...*

}

}

ApplicationContext中的所有@JsonComponent bean将自动注册到Jackson，并且由于@JsonComponent使用@Component进行元注释，所以通常的组件扫描规则适用。

Spring Boot还提供了[JsonObjectSerializer](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/jackson/JsonObjectSerializer.java) 和[JsonObjectDeserializer](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/jackson/JsonObjectDeserializer.java) 基类，在序列化对象时为标准Jackson版本提供了有用的替代方法。 有关详细信息，请参阅Javadoc。

### MessageCodesResolver

Spring MVC有一个策略来生成错误代码，用于从绑定错误中呈现错误消息：MessageCodesResolver。 如果您设置spring.mvc.message-codes-resolver.format属性PREFIX\_ERROR\_CODE或POSTFIX\_ERROR\_CODE（请参阅DefaultMessageCodesResolver.Format中的枚举），Spring Boot将为您创建一个。

### 静态内容

默认情况下，Spring Boot将从类路径中的/ static（或/ public或/ resources或/ META-INF / resources）目录或从ServletContext的根目录中提供静态内容。 它使用Spring MVC中的ResourceHttpRequestHandler，因此可以通过添加自己的WebMvcConfigurerAdapter并重写addResourceHandlers方法来修改该行为。

在stand-alone Web应用程序中，容器中的默认servlet也被启用，并作为后备，如果Spring决定不处理，则从ServletContext的根目录提供内容。 大多数情况下，这是不会发生的（除非你修改默认的MVC配置），因为Spring总是能够通过DispatcherServlet处理请求。

默认情况下，资源映射到/ \*\*，但可以通过spring.mvc.static-path- pattern调整。 例如，将所有资源重定位到/ resources / \*\*可以实现如下：

**spring.mvc.static-path-pattern**=/resources/\*\*

您也可以使用spring.resources.static-locations（使用目录位置列表替换缺省值）来自定义静态资源位置。 如果您这样做，默认的欢迎页面检测将切换到您的自定义位置。 因此，如果您的任何位置在启动时都有index.html，它将成为应用程序的主页。

除了上面的“标准”静态资源位置之外，Webjars内容还有一个特殊情况。 如果以Webjars格式打包，那么在/ webjars / \*\*中具有路径的任何资源都将从jar文件提供。

**Tip**

如果您的应用程序将被打包为jar，请不要使用src / main / webapp目录。 虽然这个目录是一个通用的标准，但是它只能用于war包装，如果你生成一个jar包，它会被大多数的构建工具默默地忽略。

Spring Boot还支持Spring MVC提供的高级资源处理功能，允许使用例如缓存清除静态资源或使用Webjars的版本不可知的URL。

要为Webjars使用版本不可知的URL，只需添加webjars-locator依赖项即可。 然后声明你的Webjar，例如jQuery，作为“/webjars/jquery/dist/jquery.min.js”，导致“/webjars/jquery/xyz/dist/jquery.min.js”其中xyz是Webjar版本。

**Note**

如果您使用的是JBoss，则需要声明webjars-locator-jboss-vfs依赖项，而不是webjars-locator; 否则所有的Webjar将解析为404。

要使用缓存清除，以下配置将为所有静态资源配置缓存清除解决方案，从而在URL中有效添加内容哈希，如<link href =“/ css / spring-2a2d595e6ed9a0b24f027f2b63b134d6.css”/>

**spring.resources.chain.strategy.content.enabled**=true **spring.resources.chain.strategy.content.paths**=/\*\*

**Note**

在模板中，资源链接在运行时被重写，这要归功于为Thymeleaf和FreeMarker自动配置的ResourceUrlEncodingFilter。 使用JSP时，您应该手动声明此过滤器。 其他模板引擎现在不会自动支持，但可以使用自定义模板宏/助手和[ResourceUrlProvider](http://docs.spring.io/spring/docs/4.3.12.RELEASE/javadoc-api/org/springframework/web/servlet/resource/ResourceUrlProvider.html)的使用。

例如，在使用JavaScript模块加载程序动态加载资源时，重命名文件不是一个选项。 这就是为什么其他策略也支持并可以结合的原因。 “fixed”策略将在URL中添加静态版本字符串，而不更改文件名称：

**spring.resources.chain.strategy.content.enabled**=true **spring.resources.chain.strategy.content.paths**=/\*\* **spring.resources.chain.strategy.fixed.enabled**=true **spring.resources.chain.strategy.fixed.paths**=/js/lib/ **spring.resources.chain.strategy.fixed.version**=v12

使用此配置，位于“/ js / lib /”下的JavaScript模块将使用固定的版本控制策略“/v12/js/lib/mymodule.js”，而其他资源仍将使用内容<link href =“/ css /spring-2a2d595e6ed9a0b24f027f2b63b134d6.css“/>。

有关更多受支持的选项，请参阅[ResourceProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/ResourceProperties.java) 。

**Tip**

这个特性已经在专门的[blog post](https://spring.io/blog/2014/07/24/spring-framework-4-1-handling-static-web-resources) 和Spring框架的参考文档([reference documentation](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#mvc-config-static-resources))中有详细的介绍。

### Custom Favicon

Spring Boot会在配置的静态内容位置和类路径的根目录（按此顺序）中查找favicon.ico。 如果这样的文件存在，它会自动用作应用程序的图标。

### ConfigurableWebBindingInitializer

Spring MVC使用WebBindingInitializer为特定请求初始化WebDataBinder。 如果您创建自己的ConfigurableWebBindingInitializer @Bean，则Spring Boot将自动配置Spring MVC以使用它。

### Template engines

除了REST Web服务，您还可以使用Spring MVC来提供动态HTML内容。 Spring MVC支持各种模板技术，包括Thymeleaf，FreeMarker和JSP。 许多其他模板引擎也提供了自己的Spring MVC集成。

Spring Boot包含以下模板引擎的自动配置支持：

* [FreeMarker](http://freemarker.org/docs/)
* [Groovy](http://docs.groovy-lang.org/docs/next/html/documentation/template-engines.html#_the_markuptemplateengine)
* [Thymeleaf](http://www.thymeleaf.org/)
* [Mustache](http://mustache.github.io/)

**Tip**

如果可能的话，JSP应该被避免，在嵌入的servlet容器中使用它们有几个已知的限制([known limitations](#_bookmark155) )。

当您使用默认配置的模板引擎之一时，您的模板将从 src/main/resources/templates 中自动获取。

**Tip**

IntelliJ IDEA根据你运行应用程序的方式不同地命令类路径。 通过主要方法在IDE中运行应用程序将导致与使用Maven或Gradle或从其打包的jar运行应用程序时不同的顺序。 这可能会导致Spring Boot无法在类路径中找到模板。 如果您受到这个问题的影响，您可以在IDE中重新排序类路径，以便首先放置模块的类和资源。 或者，您可以配置模板前缀以搜索类路径中的每个模板目录：classpath \*：/ templates /。

### Error Handling

Spring Boot默认提供了一个/error，以合理的方式处理所有的错误，并且在servlet容器中被注册为一个“global”错误页面。 对于机器客户端，它将产生一个JSON响应，包含错误的详细信息，HTTP状态和异常消息。 对于浏览器客户端，有一个'whitelabel'错误视图，它以HTML格式呈现相同的数据（自定义它只是添加一个解决'error'的视图）。 要完全替换默认行为，您可以实现ErrorController并注册该类型的bean定义，或者只需添加ErrorAttributes类型的bean以使用现有机制，但替换内容即可。

**Tip**

BasicErrorController可以用作自定义ErrorController的基类。 如果要为新的内容类型添加处理程序（默认情况下是专门处理text/html 并提供所有其他内容的回退），此功能特别有用。 为此，只需扩展BasicErrorController并添加一个带有@RequestMapping属性的公共方法，并创建一个新类型的bean。

您还可以定义@ControllerAdvice来定制JSON文档以返回特定的控制器和/或异常类型。

@ControllerAdvice(basePackageClasses = FooController.class)

**public class** FooControllerAdvice **extends** ResponseEntityExceptionHandler {

@ExceptionHandler(YourException.class) @ResponseBody

ResponseEntity<?> handleControllerException(HttpServletRequest request, Throwable ex) { HttpStatus status = getStatus(request);

**return new** ResponseEntity<>(**new** CustomErrorType(status.value(), ex.getMessage()), status);

}

**private** HttpStatus getStatus(HttpServletRequest request) {

Integer statusCode = (Integer) request.getAttribute(***"javax.servlet.error.status\_code"***);

**if** (statusCode == null) {

**return** HttpStatus.INTERNAL\_SERVER\_ERROR;

}

**return** HttpStatus.valueOf(statusCode);

}

}

在上面的例子中，如果由与FooController相同的包中定义的控制器抛出YourException，则将使用CustomErrorType POJO的json表示而不是ErrorAttributes表示形式。

#### 自定义错误页面

如果要为给定的状态代码显示自定义的HTML错误页面，请将文件添加到 /error 文件夹。 错误页面可以是静态HTML（即添加在任何静态资源文件夹下），也可以使用模板构建。 该文件的名称应该是确切的状态码或一系列掩码。

例如，要将404映射到静态HTML文件，您的文件夹结构如下所示：

src/

+- main/

+- java/

| + <source code>

+- resources/

+- public/

+- error/

| +- 404.html

+- <other public assets>

要使用FreeMarker模板来映射所有的5xx错误，你会有这样的结构：

src/

+- main/

+- java/

| + <source code>

+- resources/

+- templates/

+- error/

| +- 5xx.ftl

+- <other templates>

对于更复杂的映射，您还可以添加实现ErrorViewResolver的Bean接口。

**public class** MyErrorViewResolver **implements** ErrorViewResolver {

@Override

**public** ModelAndView resolveErrorView(HttpServletRequest request, HttpStatus status, Map<String, Object> model) {

*// Use the request or status to optionally return a ModelAndView*

**return** ...

}

}

您还可以使用常规的Spring MVC功能，如[@ExceptionHandler methods](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#mvc-exceptionhandlers)和

[@ControllerAdvice](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#mvc-ann-controller-advice)。 ErrorController将会接收任何未处理的异常。

#### 映射Spring MVC 之外的页面

对于不使用Spring MVC的应用程序，可以使用ErrorPageRegistrar接口直接注册ErrorPages。 这个抽象直接与底层的嵌入式servlet容器一起工作，即使你没有Spring MVC DispatcherServlet也可以工作。

@Bean

**public** ErrorPageRegistrar errorPageRegistrar(){

**return new** MyErrorPageRegistrar();

}

*// ...*

**private static class** MyErrorPageRegistrar **implements** ErrorPageRegistrar { @Override

**public void** registerErrorPages(ErrorPageRegistry registry) { registry.addErrorPages(**new** ErrorPage(HttpStatus.BAD\_REQUEST, ***"/400"***));

}

}

注： 如果你注册了一个错误页面，并且这个错误页面将被一个过滤器处理的路径（例如，像一些非Spring web框架，比如Jersey和Wicket），那么这个过滤器必须被明确地注册为一个错误调度器。

@Bean

**public** FilterRegistrationBean myFilter() {

FilterRegistrationBean registration = **new** FilterRegistrationBean(); registration.setFilter(**new** MyFilter());

...

registration.setDispatcherTypes(EnumSet.allOf(DispatcherType.**class**));

**return** registration;

}

（默认FilterRegistrationBean不包括ERROR调度程序类型）。

#### WebSphere Application Server上的错误处理

在部署到servlet容器时，Spring Boot使用其错误页面过滤器将具有错误状态的请求转发到适当的错误页面。 如果响应尚未提交，则只能将请求转发到正确的错误页面。 默认情况下，WebSphere Application Server 8.0和更高版本在成功完成servlet的服务方法后提交响应。 您应该通过将com.ibm.ws.webcontainer.invokeFlushAfterService设置为false来禁用此行为

### Spring HATEOAS

如果您正在开发使用超媒体(hypermedia)的RESTful API，Spring Boot为Spring HATEOAS提供了自动配置，可以与大多数应用程序配合使用。 自动配置取代了使用@EnableHypermediaSupport并注册大量bean的需求，以便于构建基于超媒体(hypermedia)的应用程序，包括LinkDiscoverers（用于客户端支持）和ObjectMapper，用于将响应正确地编组为所需的表示形式。 ObjectMapper将根据spring.jackson.\*属性或Jackson2ObjectMapperBuilder bean（如果存在）进行自定义。

你可以使用@EnableHypermediaSupport来控制Spring HATEOAS的配置。 请注意，这将禁用上述的ObjectMapper定制。

### CORS support

跨源资源共享([Cross-origin resource sharing](http://en.wikipedia.org/wiki/Cross-origin_resource_sharing) (CORS))是大多数浏览器([most browsers](http://caniuse.com/#feat%3Dcors) )实现的[W3C specification](http://www.w3.org/TR/cors/) 规范，允许您以灵活的方式指定什么样的跨域请求被授权，而不是使用像IFRAME或JSONP那样的不太安全和功能较弱的方法。

从4.2版开始，Spring MVC支持CORS([supports CORS](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#cors))开箱即用。 使用[controller method CORS](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#_controller_method_cors_configuration) [configuration](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#_controller_method_cors_configuration) 在Spring Boot应用程序中使用[@CrossOrigin](http://docs.spring.io/spring/docs/4.3.12.RELEASE/javadoc-api/org/springframework/web/bind/annotation/CrossOrigin.html) 标注的CORS配置不需要任何特定的配置。 [Global CORS configuration](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#_global_cors_configuration) 可以通过使用定制的addCorsMappings（CorsRegistry）方法注册WebMvcConfigurer bean来定义：

@Configuration

**public class** MyConfiguration {

@Bean

**public** WebMvcConfigurer corsConfigurer() {

**return new** WebMvcConfigurerAdapter() { @Override

**public void** addCorsMappings(CorsRegistry registry) { registry.addMapping(***"/api/\*\*"***);

}

};

}

}

## JAX-RS and Jersey

如果您更喜欢REST endpoints的JAX-RS编程模型，则可以使用其中一个可用的实现，而不是Spring MVC。 Jersey 1.x和Apache CXF在开箱即用的情况下工作得非常好，如果您只是在您的应用程序上下文中将其Servlet或Filter注册为@Bean。 Jersey 2.x有一些原生的Spring支持，所以我们还在Spring Boot中为它提供了自动配置支持。

要开始使用Jersey 2.x，只需将spring-boot-starter-jersey作为依赖包含在内，然后您需要一个ResourceConfig类型的@Bean，其中注册了所有的端点(endpoints)：

@Component

**public class** JerseyConfig **extends** ResourceConfig {

**public** JerseyConfig() { register(Endpoint.**class**);

}

}

**Warning**

Jersey’s对扫描可执行档案的支持是相当有限的。 例如，运行可执行的war文件时，它不能扫描WEB-INF/classes中的包中的端点(endpoints)。 为了避免这种限制，不应该使用软件包方法，并且应该使用如上所示的注册方法单独注册端点(endpoints)。

您还可以注册任意数量的实现ResourceConfigCustomizer的bean以进行更高级的自定义。

所有注册的端点(endpoints)应该是具有HTTP资源注释（@GET等）的@Components，例如

@Component @Path("/hello")

**public class** Endpoint {

@GET

**public** String message() {

**return *"Hello"***;

}

}

由于Endpoint是一个Spring @Component，因此它的生命周期由Spring管理，您可以使用@Autowired依赖关系，并使用@Value注入外部配置。 Jersey servlet将被默认注册并映射到/ \*。 您可以通过将@ApplicationPath添加到您的ResourceConfig来更改映射。

默认情况下，Jersey将被设置为一个名为jerseyServletRegistration的ServletRegistrationBean类型的@Bean中的Servlet。 默认情况下，servlet会被懒惰地初始化(initialized lazily)，但是你可以通过spring.jersey.servlet.load-on-startup来定制它。你可以通过创建一个你自己的名字来禁用或者重载这个bean。 你也可以通过设置spring.jersey.type = filter来使用Filter而不是Servlet（在这种情况下，替换或覆盖的是@Bean）是jerseyFilterRegistration。 这个servlet有一个@Order，你可以使用spring.jersey.filter.order来设置。 Servlet和Filter注册都可以通过使用spring.jersey.init.\*来指定init参数来指定属性映射。

有一个[Jersey sample](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-jersey) ，所以你可以看到如何设置的东西。 还有一个[Jersey 1.x sample](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-jersey1)。 请注意，在Jersey 1.x示例中，spring-boot maven插件已被配置为解压缩某些Jersey jar(unpack some Jersey jars)，以便JAX-RS可以扫描它们（因为示例要求在其Filter注册中扫描它们）。 如果您的任何JAX-RS资源打包为嵌套jar，则可能需要执行相同的操作。

## 嵌入式servlet容器支持

Spring Boot包括对嵌入式Tomcat，Jetty和Undertow服务器的支持。 大多数开发人员只需使用适当的“Starter”来获取完全配置的实例。 默认情况下，嵌入式服务器将侦听端口8080上的HTTP请求。

**Warning**

如果您选择在CentOS上使用Tomcat，请注意，默认情况下会使用临时目录来存储已编译的JSP，文件上载等。当您的应用程序运行时，tmpwatch可能会删除此目录导致失败。 为了避免这种情况，你可能想要自定义你的tmpwatch配置，以便tomcat.\*目录不被删除或配置server.tomcat.basedir，以便嵌入式Tomcat使用不同的位置。

### Servlets, Filters, and listeners

当使用嵌入式servlet容器时，可以通过使用Spring bean或通过扫描Servlet组件来注册Servlet，Filters和Servlet规范中的所有监听器（例如HttpSessionListener）。

#### Registering Servlets, Filters, and listeners as Spring beans

任何作为Spring bean的Servlet，Filter或Servlet \* Listener实例都将在嵌入容器中注册。 如果要在配置期间从application.properties中引用值，这可能会特别方便。

默认情况下，如果上下文(context)只包含一个Servlet，它将被映射到/。 在多个Servlet bean的情况下，bean名称将被用作路径前缀。 过滤器将映射到/ \*。

### Servlet Context Initialization

嵌入式servlet容器不会直接执行Servlet 3.0+ javax.servlet.ServletContainerInitializer接口或Spring的org.springframework.web.WebApplicationInitializer接口。 这是一个有意的设计决策，旨在降低设计在战争中运行的第三方库将破坏Spring Boot应用程序的风险。

如果您需要在Spring Boot应用程序中执行servlet上下文初始化，则应该注册一个实现了org.springframework.boot.context.embedded.ServletContextInitializer接口的bean。 单一的onStartup方法提供了对ServletContext的访问，并且如果需要的话可以很容易地用作现有WebApplicationInitializer的适配器。

#### Scanning for Servlets, Filters, and listeners

当使用嵌入式容器时，自动注册@WebServlet，@WebFilter和

可以使用@ServletComponentScan启用@WebListener注释类。

**Tip**

@ServletComponentScan在独立的容器中将不起作用，容器的内置发现机制将被使用。

### The EmbeddedWebApplicationContext

Spring Boot使用了一种新型的ApplicationContext来实现对嵌入式servlet容器的支持。 EmbeddedWebApplicationContext是一种特殊类型的WebApplicationContext，通过搜索单个EmbeddedServletContainerFactory bean来引导自身。 通常，TomcatEmbeddedServletContainerFactory，JettyEmbeddedServletContainerFactory或UndertowEmbeddedServletContainerFactory将被自动配置。

**Note**

您通常不需要知道这些实现类。 大多数应用程序将被自动配置，并且将代表您创建相应的ApplicationContext和EmbeddedServletContainerFactory。

### Customizing embedded servlet containers

通用的servlet容器设置可以使用Spring Environment属性进行配置。 通常你会在你的application.properties文件中定义属性。

通用服务器设置包括:

* 网络设置：传入HTTP请求的侦听端口（server.port），绑定到server.address的接口地址等
* 会话(Session)设置：会话是否持续（server.session.persistence），会话超时（server.session.timeout），会话数据的位置（server.session.store-dir）和会话cookie配置（server.session.cookie）。
* 错误管理：错误页面的位置（server.error.path）等
* [SSL](#_bookmark464)
* [HTTP compression](#_bookmark486)

Spring Boot尽可能地尝试暴露常见的设置，但这并不总是可能的。 对于这些情况，专用名称空间提供了特定于服务器的定制（请参阅server.tomcat和server.undertow）。 例如，可以使用嵌入式servlet容器的特定功能来配置访问日志([access logs](#_bookmark465) )。

**Tip**

参阅 [ServerProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/ServerProperties.java) 类以获取完整列表

#### 程序化定制 (Programmatic customization)

如果您需要以编程方式配置嵌入式Servlet容器，则可以注册一个实现了EmbeddedServletContainerCustomizer接口的Spring bean。 EmbeddedServletContainerCustomizer提供对ConfigurableEmbeddedServletContainer的访问，其中包含大量定制设置方法。

**import** org.springframework.boot.context.embedded.\*;

**import** org.springframework.stereotype.Component;

@Component

**public class** CustomizationBean **implements** EmbeddedServletContainerCustomizer {

@Override

**public void** customize(ConfigurableEmbeddedServletContainer container) { container.setPort(9000);

}

}

#### 直接自定义 ConfigurableEmbeddedServletContainer

如果上述自定义技术太有限，则可以自己注册TomcatEmbeddedServletContainerFactory，JettyEmbeddedServletContainerFactory或UndertowEmbeddedServletContainerFactory bean。

@Bean

**public** EmbeddedServletContainerFactory servletContainer() { TomcatEmbeddedServletContainerFactory factory = **new** TomcatEmbeddedServletContainerFactory(); factory.setPort(9000);

factory.setSessionTimeout(10, TimeUnit.MINUTES);

factory.addErrorPages(**new** ErrorPage(HttpStatus.NOT\_FOUND, ***"/notfound.html"***));

**return** factory;

}

安装程序提供了许多配置选项。 还提供了几个受保护的方法“hooks”，如果你需要做更奇特的事情。 有关详细信息，请参阅源代码文档。

### JSP 限制

运行使用嵌入式servlet容器的Spring Boot应用程序（并打包为可执行文件）时，JSP支持有一些限制。

* 使用Tomcat时，如果使用war包，即可执行的war会运行，并且可以部署到标准容器（不限于Tomcat），也可以部署到Tomcat。 由于Tomcat中的硬编码文件模式，可执行jar不起作用。
* 使用Jetty时，如果使用war打包，即可执行的war可以工作，并且也可以部署到任何标准容器，则应该可以工作。[error handling](#_bookmark139), [custom error pages](#_bookmark140)
* Undertow 不支持 JSPs.
* 创建自定义error.jsp页面不会覆盖错误处理([error handling](#_bookmark139))的默认视图，而应该使用自定义错误页面( [custom error pages](#_bookmark140) )。

# Security

如果Spring Security位于类路径上，那么默认情况下，Web应用程序将在所有HTTP端点上进行“basic”身份验证。 要向Web应用程序添加方法级别的安全性，您还可以添加所需设置的@EnableGlobalMethodSecurity。 更多的信息可以在[Spring Security Reference](http://docs.spring.io/spring-security/site/docs/4.2.3.RELEASE/reference/htmlsingle#jc-method).中找到。

默认的AuthenticationManager有一个用户（'user'用户名和随机密码，当应用程序启动时以INFO级别打印）

Using default security password: 78fa095d-3f4c-48b1-ad50-e24c31d5cf35

**Note**

如果您对日志记录配置进行了微调，请确保将org.springframework.boot.autoconfigure.security类别设置为记录INFO消息，否则将不会打印默认密码。

您可以通过提供一个security.user.password来更改密码。 这个和其他有用的属性通过[SecurityProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/security/SecurityProperties.java) （属性前缀“security”）来外化。

默认的安全配置是在SecurityAutoConfiguration和从那里导入的类中实现的（SpringBootWebSecurityConfiguration用于web安全性，AuthenticationManagerConfiguration用于在非web应用中也是相关的认证配置）。 要完全关闭默认的Web应用程序安全配置，您可以使用@EnableWebSecurity添加一个bean（这不会禁用认证管理器配置或Actuator的安全性）。 要定制它，通常使用WebSecurityConfigurerAdapter类型的外部属性和bean（例如添加基于表单的登录）。

**Note**

如果添加@EnableWebSecurity并禁用Actuator安全性，则将为整个应用程序获取默认的基于表单的登录，除非添加自定义的WebSecurityConfigurerAdapter。

要关闭身份验证管理器配置(authentication manager configuration)，您可以添加一个AuthenticationManager类型的bean，或者通过将AuthenticationManagerBuilder自动装配到您的一个@Configuration类中的方法来配置全局AuthenticationManager。 在[Spring Boot samples](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/) 中有几个安全的应用程序来帮助您开始使用常见用例。

您在Web应用程序中使用的基本功能是：

▪ 一个好的AuthenticationManager bean在内存中存储和单个用户（见SecurityProperties.User作为用户的属性）。

* 常见静态资源位置 (/css/\*\*, /js/\*\*, /images/\*\*, / webjars/\*\* and \*\*/favicon.ico).
* 所有其他端点的HTTP基本安全性。
* 发布到Spring的ApplicationEventPublisher的安全事件（成功和失败的身份验证和访问被拒绝）。
* Spring Security提供的常见底层特性（HSTS，XSS，CSRF，caching）默认是开启的。

以上所有功能都可以使用外部属性（security.\*）来打开和关闭或修改。 要覆盖访问规则而不更改任何其他自动配置的功能，请使用@Order（SecurityProperties.ACCESS\_OVERRIDE\_ORDER）添加一个类型为WebSecurityConfigurerAdapter的@Bean，并对其进行配置以满足您的需求。

**Note**

默认情况下，WebSecurityConfigurerAdapter将匹配任何路径。 如果您不想完全覆盖Spring Boot的自动配置的访问规则，则您的适配器必须显式配置您想覆盖的路径。

## OAuth2

如果在类路径上有spring-security-oauth2，则可以利用一些自动配置来轻松设置授权或资源服务器。 有关完整的详细信息，请参阅[Security OAuth 2 Developers Guide](http://projects.spring.io/spring-security-oauth/docs/oauth2.html)。

### 授权服务器

要创建授权服务器并授予访问令牌(tokens)，您需要使用@EnableAuthorizationServer并提供security.oauth2.client.client-id和security.oauth2.client.client-secret]属性。 客户端将在内存资源库中注册。

完成之后，您将能够使用客户端凭据创建访问令牌(token)，例如：

$ curl client:secret@localhost:8080/oauth/token -d grant\_type=password -d username=user -d password=pwd

/ token端点的基本认证凭证是client-id和client-secret。 用户凭证是普通的Spring Security用户详细信息（在Spring Boot中默认为“user”和一个随机密码）。

### 资源服务器

要使用访问令牌(token)，您需要一个资源服务器（可以与授权服务器相同）。 创建资源服务器很简单，只需添加@EnableResourceServer并提供一些配置，以允许服务器解码访问令牌(token)。 如果您的应用程序也是一个授权服务器，它已经知道如何解码令牌(token)，所以没有别的办法。 如果你的应用是一个独立的服务，那么你需要给它更多的配置，以下选项之一：

* security.oauth2.resource.user-info-uri使用/ me resource（例如Pivotal Web Services（PWS）上的https：// uaa.run.pivotal.io/userinfo）

▪ security.oauth2.resource.token-info-uri使用令牌(token)解码端点（例如，

PWS上的https://uaa.run.pivotal.io/check\_token）。

如果你同时指定了user-info-uri和token-info-uri，那么你可以设置一个标志来说明一个是比另一个优先的（prefer-token-info = true是默认值）。

如果令牌(token)是JWT，或者（而不是user-info-uri或token-info-uri），则可以配置security.oauth2.resource.jwt.key-value以在本地对其进行解码（其中密钥是验证密钥）。 验证密钥值是对称密钥或PEM编码的RSA公钥。 如果你没有密钥并且它是公开的，你可以提供一个可以下载的URI（作为带有“value”字段的JSON对象）和security.oauth2.resource.jwt.key-uri。 例如。 在PWS上：

$ curl https://uaa.run.pivotal.io/token\_key

{"alg":"SHA256withRSA","value":"-----BEGIN PUBLIC KEY-----\nMIIBI...\n-----END PUBLIC KEY-----\n"}

此外，如果您的授权服务器具有返回一组JSON Web密钥（JWK）的端点，则可以配置security.oauth2.resource.jwk.key-set-uri。 例如。 在PWS上：

$ curl https://uaa.run.pivotal.io/token\_keys

{"keys":[{"kid":"key-1","alg":"RS256","value":"-----BEGIN PUBLIC KEY-----\nMIIBI...\n-----END PUBLIC KEY-----\n"]}

**Note**

配置JWT和JWK属性都会导致错误。 应该只配置security.oauth2.resource.jwt.key-uri（或security.oauth2.resource.jwt.key-value）和security.oauth2.resource.jwk.key-set-uri中的一个。

**Warning**

如果使用security.oauth2.resource.jwt.key-URI或

`security.oauth2.resource.jwk.key-set-uri'，授权服务器需要在应用程序启动时运行。 如果找不到密钥，它会记录警告，并告诉您如何解决问题。

OAuth2资源受过滤器链保护，顺序为security.oauth2.resource.filter- order，缺省情况下，过滤器默认保护执行器端点（因此执行器端点将保持HTTP Basic，除非您更改顺序）。

## Token 类型的用户信息

Google和某些其他第三方身份提供商对标头中发送给用户信息端点的标记类型名称更为严格。 默认是适合大多数提供者的“Bearer”，并且符合规范，但是如果你需要改变它，你可以设置security.oauth2.resource.token-type。

## 自定义用户信息 RestTemplate

如果您有user-info-uri，资源服务器功能在内部使用OAuth2RestTemplate来获取用于验证的用户详细信息。

这是作为UserInfoRestTemplateFactory类型的@Bean提供的。 对于大多数提供者来说，默认值应该是可

以的，但是偶尔你可能需要添加额外的拦截器，或者改变请求认证者（这是令牌被附加到传出请求的方式）。

要添加一个自定义，只需创建一个UserInfoRestTemplateCustomizer类型的bean - 它有一个方法，在bean被

创建之后但在被初始化之前被调用。 正在定制的其余模板这里只是用来进行身份验证。 或者，你可以定义你

自己的UserInfoRestTemplateFactory @Bean来完全控制。

**Tip**

要在YAML中设置RSA键值，可以使用“管道”连续标记将其分割成多行（“|”）并记住缩进键值（这是标准的YAML语言功能）。 例：

**security**:

**oauth2**:

**resource**:

**jwt**:

**keyValue**: |

-----BEGIN PUBLIC KEY----- MIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKC...

-----END PUBLIC KEY-----

### Client

要将您的Web应用程序转换为OAuth2客户端，您可以简单地添加@EnableOAuth2Client，Spring Boot将创建一个OAuth2ClientContext和OAuth2ProtectedResourceDetails，这些是创建OAuth2RestOperations所必需的。 Spring Boot不会自动创建这样的bean，但您可以轻松创建自己的：

@Bean

**public** OAuth2RestTemplate oauth2RestTemplate(OAuth2ClientContext oauth2ClientContext, OAuth2ProtectedResourceDetails details) {

**return new** OAuth2RestTemplate(details, oauth2ClientContext);

}

**Note**

您可能需要添加限定符，并将您的配置作为多个RestTemplate进行检查

可能会在您的应用程序中定义。

此配置使用security.oauth2.client.\*作为凭证（与您在Authorization Server中使用的相同），但此外还需要了解授权服务器中的授权和令牌URI。 例如：

**application.yml.**

**security**:

**oauth2**:

**client**:

**clientId**: bd1c0a783ccdd1c9b9e4

**clientSecret**: 1a9030fbca47a5b2c28e92f19050bb77824b5ad1 **accessTokenUri**: https://github.com/login/oauth/access\_token **userAuthorizationUri**: https://github.com/login/oauth/authorize **clientAuthenticationScheme**: form

当您尝试使用OAuth2RestTemplate时，具有此配置的应用程序将重定向到Github进行授权。 如果您已经登录到Github，您甚至不会注意到它已经通过身份验证。 如果您的应用程序在端口8080上运行（在Github或其他提供程序中注册您自己的客户端应用程序以获得更大的灵活性），这些特定的凭据将仅适用。

限制客户端在获取您可以设置的访问令牌时所要求的范围

security.oauth2.client.scope（逗号分隔或YAML中的数组）。 默认情况下，作用域为空，授权服务器决定默认设置应该是什么，通常取决于它所保存的客户端注册中的设置。

**Note**

还有一个curity.oauth2.client.client-authentication-scheme默认为“header”的设置（但如果像Github一样，你可能需要将它设置为“form”，你的OAuth2提供者不喜欢头认证）。 实际上，security.oauth2.client.\*属性绑定到AuthorizationCodeResourceDetails的一个实例，因此可以指定它的所有属性。

**Tip**

在非web应用程序中，您仍然可以创建OAuth2RestOperations，并且它仍然连接到security.oauth2.client.\*配置。 在这种情况下，它是一个“客户端凭据令牌授予(client credentials token grant)”，如果您使用它（并且不需要使用@EnableOAuth2Client或@EnableOAuth2Sso），您将会询问您。 要防止定义基础结构，只需从您的配置中删除security.oauth2.client.client-id（或将其设置为空字符串）。

### 单点登录

可以使用OAuth2客户端从提供者(provider)获取用户详细信息（如果这些功能可用），然后将其转换为Spring Security的身份验证令牌。 上面的资源服务器通过user-info-uri属性支持这一点。这是基于OAuth2的单点登录（SSO）协议的基础，Spring Boot通过提供注释@EnableOAuth2Sso使参与变得容易。 上面的Github客户端可以使用Github / user / endpoint保护所有的资源并进行身份验证，通过添加注释并声明在哪里可以找到端点（除了上面已经列出的security.oauth2.client.\*配置外）：

**application.yml.**

**security**:

**oauth2**:

...

**resource**:

**userInfoUri**: https://api.github.com/user

**preferTokenInfo**: **false**

由于默认情况下所有路径都是安全的，因此没有“home”页面，您可以向未经身份验证的用户显示并请他们登录（通过访问/ login路径或security.oauth2.sso.login-path指定的路径）。

要定制访问规则或路径来保护，所以你可以添加一个“home”页面，@EnableOAuth2Sso可以被添加到一个WebSecurityConfigurerAdapter中，并且这个注释将使它被装饰和增强，并带有必要的部分来获得/ login 路径工作。 例如，在这里，我们只允许对“/”的主页进行未经验证的访问，并保留其他所有的默认值：

@Configuration

**static class** WebSecurityConfiguration **extends** WebSecurityConfigurerAdapter {

@Override

**public void** init(WebSecurity web) { web.ignoring().antMatchers(***"/"***);

}

@Override

**protected void** configure(HttpSecurity http) **throws** Exception { http.antMatcher(***"/\*\*"***).authorizeRequests().anyRequest().authenticated();

}

}

## Actuator Security

如果Actuator也在使用中，你会发现：

* 即使应用程序端点不安全，管理端点也是安全的。
* 安全事件转换为AuditEvent实例并发布到AuditEventRepository。
* 默认用户将具有ACTUATOR角色以及USER角色。

执行器(Acturator)安全功能可以使用外部属性（management.security.\*）进行修改。 要覆盖应用程序访问规则，请添加WebSecurityConfigurerAdapter类型的@Bean，如果您不想覆盖执行程序访问规则，请使用@Order（SecurityProperties.ACCESS\_OVERRIDE\_ORDER），如果您要覆盖执行程序访问规则，请使用@Order（ManagementServerProperties.ACCESS\_OVERRIDE\_ORDER） 执行器访问规则。

# 使用 SQL 数据库

Spring框架为使用SQL数据库提供了广泛的支持。 从使用JdbcTemplate的直接JDBC访问到完成诸如Hibernate的“对象关系映射”技术。 Spring Data提供了额外的功能级别，直接从接口创建Repository实现，并使用约定从方法名称中生成查询。

## 配置数据源(DataSource)

Java的javax.sql.DataSource接口提供了使用数据库连接的标准方法。 传统上，DataSource使用URL和一些凭据来建立数据库连接。

**Tip**

检查更多高级示例的“[the ‘How-to’ section](#_bookmark505) ”部分，通常要完全控制DataSource的配置。

### 支持嵌入式数据源(Database)

使用内存嵌入式数据库开发应用程序通常很方便。 显然，内存数据库不提供持久性存储; 您将需要在应用程序启动时填充数据库，并准备在应用程序结束时丢弃数据。

**Tip**

“操作方法”部分包含有关如何初始化数据库的一节[*section on how to initialize a database*](#_bookmark517)

Spring Boot可以自动配置嵌入式[H2](http://www.h2database.com/), [HSQL](http://hsqldb.org/) 和 [Derby](http://db.apache.org/derby/) 数据库。 您不需要提供任何连接URL，只需将构建依赖项包含到要使用的嵌入式数据库中即可。

**Note**

如果您在测试中使用此功能，则可能会注意到无论您使用的是多少个应用程序上下文，整个测试套件都会重复使用相同的数据库。 如果你想确保每个上下文有一个单独的嵌入式数据库，你应该设置spring.datasource.generate-unique-name为true。

例如，典型的POM依赖关系是：

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-data-jpa**</artifactId>**

**</dependency>**

**<dependency>**

**<groupId>**org.hsqldb**</groupId>**

**<artifactId>**hsqldb**</artifactId>**

**<scope>**runtime**</scope>**

**</dependency>**

**Note**

您需要依靠spring-jdbc来自动配置嵌入式数据库。 在这个例子中，它是通过spring-boot-starter-data-jpa传递的。

**Tip**

如果出于某种原因，您要为嵌入式数据库配置连接URL，则应注意确保数据库的自动关闭被禁用。 如果您使用H2，则应使用DB\_CLOSE\_ON\_EXIT = FALSE来执行此操作。 如果你正在使用HSQLDB，你应该确保不使用shutdown = true。 禁用数据库的自动关闭允许Spring Boot控制何时关闭数据库，从而确保在不再需要访问数据库时发生。

### 连接到生产数据库

生产数据库连接也可以使用池化数据源自动配置。 以下是选择特定实现的算法：

* 我们更喜欢Tomcat将数据源集成到DataSource的性能和并发性，所以如果可用的话，我们总是选择它。
* 否则，如果HikariCP可用，我们将使用它。
* 如果Tomcat池数据源和HikariCP都不可用，并且Commons DBCP可用，我们将使用它，但我们不建议在生产中使用它，并且不支持它。
* 最后，如果Commons DBCP2可用，我们将使用它。

如果使用spring-boot-starter-jdbc或spring-boot-starter-data-jpa'starters'，则会自动获得对tomcat-jdbc的依赖关系。

**Note**

您可以完全绕过该算法，并通过spring.datasource.type属性指定要使用的连接池。 如果您在Tomcat容器中运行应用程序，这一点尤其重要，因为默认情况下提供了tomcat-jdbc。

**Tip**

其他连接池可以始终手动配置。 如果你定义你自己的数据源bean，自动配置将不会生效。

DataSource配置由spring.datasource.\*中的外部配置属性控制。 例如，您可以在application.properties中声明以下部分：

**spring.datasource.url**=jdbc:mysql://localhost/test **spring.datasource.username**=dbuser **spring.datasource.password**=dbpass **spring.datasource.driver-class-name**=com.mysql.jdbc.Driver

**Note**

您至少应该使用spring.datasource.url属性指定url，否则Spring Boot将尝试自动配置嵌入式数据库。

**Tip**

您通常不需要指定驱动程序类名称，因为Spring引导可以从url中为大多数数据库推断它。

**Note**

对于要创建的池数据源，我们需要能够验证有效的驱动程序类是否可用，所以我们在做任何事之前都要检查它。即 如果你设置spring.datasource.driver-class-name = com.mysql.jdbc.Driver，那么这个类必须是可加载的。

有关更多受支持的选项，请参阅[DataSourceProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jdbc/DataSourceProperties.java) 。 这些是标准选项，不管实际的实施情况如何。 还可以使用各自的前缀（spring.datasource.tomcat.\*，spring.datasource.hikari.\*和spring.datasource.dbcp2.\*）来微调特定于实现的设置。 请参阅您正在使用的连接池实现的文档以获取更多详细信息。

例如，如果您正在使用Tomcat连接池，则可以自定义许多其他设置：

*# Number of ms to wait before throwing an exception if no connection is available.*

**spring.datasource.tomcat.max-wait**=10000

*# Maximum number of active connections that can be allocated from this pool at the same time.*

**spring.datasource.tomcat.max-active**=50

*# Validate the connection before borrowing it from the pool.*

**spring.datasource.tomcat.test-on-borrow**=true

### 连接到一个JNDI数据源

如果您将Spring Boot应用程序部署到应用程序服务器，则可能需要使用应用程序服务器内置功能配置和管理数据源，并使用JNDI访问它。

spring.datasource.jndi-name属性可以用来替代spring.datasource.url，spring.datasource.username和spring.datasource.password属性来访问特定JNDI位置的数据源。 例如，application.properties中的以下部分显示了如何访问JBoss AS定义的数据源：

**spring.datasource.jndi-name**=java:jboss/datasources/customers

## Using JdbcTemplate

Spring’s JdbcTemplate and NamedParameterJdbcTemplate classes are auto-configured and you can @Autowire them directly into your own beans:

**import** org.springframework.beans.factory.annotation.Autowired;

**import** org.springframework.jdbc.core.JdbcTemplate;

**import** org.springframework.stereotype.Component;

@Component

**public class** MyBean {

**private final** JdbcTemplate jdbcTemplate; @Autowired

**public** MyBean(JdbcTemplate jdbcTemplate) {

**this**.jdbcTemplate = jdbcTemplate;

}

*// ...*

}

## JPA 和 ‘Spring Data’

Java持久性API是一种标准技术，允许您将对象映射到关系数据库。 spring-boot-starter-data-jpa POM提供了一个快速开始的方法。 它提供了以下关键依赖关系：

* Hibernate - 最流行的JPA实现之一。
* Spring Data JPA - 使实现基于JPA的存储库变得很容易。
* Spring ORM - Spring框架的核心ORM支持。

**Tip**

这里我们不会涉及太多的JPA或Spring Data的细节。 您可以按照[spring.io](http://spring.io/)中的'使用JPA访问数据([‘Accessing](http://spring.io/guides/gs/accessing-data-jpa/) [Data with JPA’](http://spring.io/guides/gs/accessing-data-jpa/))'指导并阅读[Spring Data JPA](http://projects.spring.io/spring-data-jpa/)和[Hibernate](http://hibernate.org/orm/documentation/)参考文档。

**Note**

默认情况下，Spring Boot使用Hibernate 5.0.x. 但是，如果您愿意，也可以使用4.3.x或5.2.x。 请参阅[Hibernate 4](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-hibernate4) 和 [Hibernate 5.2](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-hibernate52) 示例以了解如何执行此操作。

### 实体类(Entity Classes)

传统上，JPA的“实体”类是在persistence.xml文件中指定的。 使用Spring Boot这个文件是不必要的，而是使用“实体扫描”。 默认情况下，将会搜索主配置类下的所有包（使用@EnableAutoConfiguration或@SpringBootApplication注解的包）。

任何用@Entity，@Embeddable或@MappedSuperclass注解的类都将被考虑。 典型的实体类看起来像这样：

**package** com.example.myapp.domain;

**import** java.io.Serializable;

**import** javax.persistence.\*;

@Entity

**public class** City **implements** Serializable {

@Id @GeneratedValue **private** Long id;

@Column(nullable = false)

**private** String name;

@Column(nullable = false)

**private** String state;

*// ... additional members, often include @OneToMany mappings*

**protected** City() {

*// no-args constructor required by JPA spec*

*// this one is protected since it shouldn't be used directly*

}

**public** City(String name, String state) {

**this**.name = name;

**this**.country = country;

}

**public** String getName() {

**return this**.name;

}

**public** String getState() {

**return this**.state;

}

*// ... etc*

}

**Tip**

您可以使用@EntityScan批注自定义实体扫描位置。 [*Section 77.4, “Separate @Entity definitions from Spring configuration”*](#_bookmark508) 。

### Spring Data JPA Repositories

Spring Data JPA存储库是您可以定义以访问数据的接口。 JPA查询是从您的方法名称自动创建的。 例如，CityRepository接口可能会声明findAllByState（String state）方法来查找给定状态下的所有城市。

对于更复杂的查询，您可以使用Spring Data Query注释来注释您的方法。

Spring数据存储库通常从 [Repository](http://docs.spring.io/spring-data/commons/docs/current/api/org/springframework/data/repository/Repository.html) 或 [CrudRepository](http://docs.spring.io/spring-data/commons/docs/current/api/org/springframework/data/repository/CrudRepository.html) 接口扩展而来。 如果使用自动配置，则将从包含主配置类（使用@EnableAutoConfiguration或@SpringBootApplication注释的那个）的包中搜索存储库。

这是一个典型的Spring数据库：

**package** com.example.myapp.domain;

**import** org.springframework.data.domain.\*;

**import** org.springframework.data.repository.\*;

**public interface** CityRepository **extends** Repository<City, Long> { Page<City> findAll(Pageable pageable);

City findByNameAndCountryAllIgnoringCase(String name, String country);

}

**Tip**

我们几乎没有触及Spring Data JPA的表面。 有关完整的详细信息，请查阅[reference documentation](http://projects.spring.io/spring-data-jpa/)。

### 创建和删除 JPA databases

默认情况下，只有在使用嵌入式数据库（H2，HSQL或Derby）时才会自动创建JPA数据库。 您可以使用spring.jpa.\*属性显式配置JPA设置。 例如，要创建和删除表，可以将以下内容添加到application.properties中。

spring.jpa.hibernate.ddl-auto=create-drop

**Note**

Hibernate自己的内部属性名称（如果你碰巧记得更好）是hibernate.hbm2ddl.auto。 您可以使用spring.jpa.properties.\*（在将前缀添加到实体管理器之前剥离前缀）将其与其他Hibernate本机属性一起设置。

Example:

spring.jpa.properties.hibernate.globally\_quoted\_identifiers=true

将hibernate.globally\_quoted\_identifiers传递给Hibernate实体管理器。

默认情况下，DDL执行（或验证）被推迟到ApplicationContext已经启动。 还有一个spring.jpa.generate-ddl标志，但是如果Hibernate自动配置处于活动状态，则不会使用该标志，因为ddl-auto设置更加精细。

### Open EntityManager in View

如果你正在运行一个web应用程序，Spring Boot将默认注册[OpenEntityManagerInViewInterceptor](http://docs.spring.io/spring/docs/4.3.12.RELEASE/javadoc-api/org/springframework/orm/jpa/support/OpenEntityManagerInViewInterceptor.html) 来应用“在视图中打开EntityManager”模式，即允许在web视图中延迟加载。 如果你不想要这个行为，你应该在你的application.properties中将spring.jpa.open-in-view设置为false。

## 使用 H2’s web console

[H2 database](http://www.h2database.com/) 提供了一个基于浏览器的控制台([browser-based console](http://www.h2database.com/html/quickstart.html#h2_console) )，Spring Boot可以为你自动配置。 当满足以下条件时，控制台将自动配置：

* 您正在开发一个Web应用程序
* com.h2database：h2位于 classpath
* 您正在使用Spring Boot的开发人员工具 [Spring Boot’s developer tools](#_bookmark67)

**Tip**

如果你不使用Spring Boot的开发工具，但仍然想使用H2的控制台，那么你可以通过配置值为true的spring.h2.console.enabled属性来实现。 H2控制台仅用于开发过程中，因此应注意确保在生产环境中将spring.h2.console.enabled设置为true。

### 改变 H2 console’s path

默认情况下，控制台将在/ h2-console上可用。 您可以使用spring.h2.console.path属性自定义控制台的路径。

### Securing the H2 console

当Spring Security在类路径上并且启用了基本身份验证时，H2控制台将使用基本身份验证自动进行保护。 以下属性可用于自定义安全性配置：

* security.user.role
* security.basic.authorize-mode
* security.basic.enabled

## 使用 jOOQ

Java面向对象查询([jOOQ](http://www.jooq.org/))是[Data Geekery](http://www.datageekery.com/) 的一个流行产品，它可以从您的数据库中生成Java代码，并允许您通过流畅的API构建类型安全的SQL查询。 商业和开源版本都可以和Spring Boot一起使用。

### (代码生成)Code Generation

为了使用jOOQ类型安全的查询，您需要从数据库模式生成Java类。 您可以按照jOOQ用户手册([jOOQ user manual](http://www.jooq.org/doc/3.6/manual-single-page/#jooq-in-7-steps-step3))中的说明进行操作。 如果您使用的是jooq-codegen-maven插件（也可以使用spring-boot-starter-parent“parent POM”），则可以安全地省略插件的<version>标签。 您也可以使用Spring Boot定义的版本变量（例如h2.version）来声明插件的数据库依赖性。 这是一个例子：

**<plugin>**

**<groupId>**org.jooq**</groupId>**

**<artifactId>**jooq-codegen-maven**</artifactId>**

**<executions>**

...

**</executions>**

**<dependencies>**

**<dependency>**

**<groupId>**com.h2database**</groupId>**

**<artifactId>**h2**</artifactId>**

**<version>**${h2.version}**</version>**

**</dependency>**

**</dependencies>**

**<configuration>**

**<jdbc>**

**<driver>**org.h2.Driver**</driver>**

**<url>**jdbc:h2:~/yourdatabase**</url>**

**</jdbc>**

**<generator>**

...

**</generator>**

**</configuration>**

**</plugin>**

### 使用 DSLContext

jOOQ提供的流畅API是通过org.jooq.DSLContext接口启动的。 Spring Boot会自动配置一个DSLContext作为Spring Bean并将其连接到您的应用程序DataSource。 要使用DSLContext，你可以@Autowire它：

@Component

**public class** JooqExample **implements** CommandLineRunner {

**private final** DSLContext create;

@Autowired

**public** JooqExample(DSLContext dslContext) {

**this**.create = dslContext;

}

}

**Tip**

jOOQ手册倾向于使用一个名为create的变量来保存DSLContext，我们在这个例子中也做了同样的事情。

然后，您可以使用DSLContext来构建您的查询：

**public** List<GregorianCalendar> authorsBornAfter1980() {

**return this**.create.selectFrom(AUTHOR)

.where(AUTHOR.DATE\_OF\_BIRTH.greaterThan(**new** GregorianCalendar(1980, 0, 1)))

.fetch(AUTHOR.DATE\_OF\_BIRTH);

}

### 自定义JOOQ(Customizing Jooq)

你可以通过设置spring.jooq.sql-dialect来自定义jOOQ使用的SQL方言

application.properties。 例如，要指定Postgres，您可以添加：

**spring.jooq.sql-dialect**=Postgres

更高级的自定义可以通过定义自己的@Bean定义来实现，这将在创建jOOQ配置时使用。 您可以为以下jOOQ类型定义bean：

* ConnectionProvider
* TransactionProvider
* RecordMapperProvider
* RecordListenerProvider
* ExecuteListenerProvider
* VisitListenerProvider

如果要完全控制jOOQ配置，也可以创建自己的org.jooq.Configuration @Bean。

# 使用 NoSQL 技术

Spring Data提供的其他项目可以帮助您访问各种NoSQL技术，包括[MongoDB](http://projects.spring.io/spring-data-mongodb/), [Neo4J](http://projects.spring.io/spring-data-neo4j/), [Elasticsearch](https://github.com/spring-projects/spring-data-elasticsearch/), [Solr](http://projects.spring.io/spring-data-solr/), [Redis](http://projects.spring.io/spring-data-redis/), [Gemfire](http://projects.spring.io/spring-data-gemfire/), [Cassandra](http://projects.spring.io/spring-data-cassandra/), [Couchbase](http://projects.spring.io/spring-data-couchbase/) 和 [LDAP](http://projects.spring.io/spring-data-ldap/)。 Spring Boot提供Redis，MongoDB，Neo4j，Elasticsearch，Solr Cassandra，Couchbase和LDAP的自动配置; 你可以使用其他项目，但是你需要自己配置它们。 请参阅[projects.spring.io/spring-data](http://projects.spring.io/spring-data).上的相应参考文档。

## Redis

[Redis](http://redis.io/) 是一个缓存，消息代理和功能丰富的键值存储。 Spring Boot为Jedis客户端库和[Spring Data Redis](https://github.com/spring-projects/spring-data-redis)提供的抽象类提供基本的自动配置。 有一个spring-boot-starter-data-redis“Starter”，用于方便地收集依赖关系。

### 连接到 Redis

您可以像其他Spring Bean一样注入自动配置的RedisConnectionFactory，StringRedisTemplate或者vanilla RedisTemplate实例。 默认情况下，实例将尝试使用localhost连接到Redis服务器：6379：

@Component

**public class** MyBean {

**private** StringRedisTemplate template; @Autowired

**public** MyBean(StringRedisTemplate template) {

**this**.template = template;

}

*// ...*

}

如果你添加了自己的@Bean自动配置的类型，它将会替换默认的（除了RedisTemplate的情况，排除是基于bean名称'redisTemplate'而不是它的类型的）。 如果commons-pool2在类路径上，默认情况下你会得到一个池连接工厂。

## MongoDB

[MongoDB](http://www.mongodb.com/)是一个开源NoSQL文档数据库，它使用类似JSON的模式而不是传统的基于表格的关系数据。 Spring Boot为使用MongoDB提供了一些便利，包括spring-boot-starter-data-mongodb“Starter”。

### 连接到 MongoDB database

您可以注入一个自动配置的org.springframework.data.mongodb.MongoDbFactory来访问Mongo数据库。 默认情况下，实例将尝试使用URL mongodb：// localhost / test连接到MongoDB服务器：

**import** org.springframework.data.mongodb.MongoDbFactory;

**import** com.mongodb.DB;

@Component

**public class** MyBean {

**private final** MongoDbFactory mongo; @Autowired

**public** MyBean(MongoDbFactory mongo) {

**this**.mongo = mongo;

}

*// ...*

**public void** example() {

DB db = mongo.getDb();

*// ...*

}

}

您可以设置spring.data.mongodb.uri属性来更改URL并配置其他设置，如副本集：

**spring.data.mongodb.uri**=mongodb://user:secret@mongo1.example.com:12345,mongo2.example.com:23456/test

另外，只要你使用Mongo 2.x，指定一个主机/端口。 例如，您可以在application.properties中声明以下内容：

**spring.data.mongodb.host**=mongoserver **spring.data.mongodb.port**=27017

**Note**

如果您使用的是Mongo 3.0 Java驱动程序，则不支持spring.data.mongodb.host和spring.data.mongodb.port。 在这种情况下，应该使用spring.data.mongodb.uri来提供所有的配置。

**Tip**

如果未指定spring.data.mongodb.port，则使用默认值27017。 你可以简单地从上面的示例中删除这一行。

**Tip**

如果你不使用Spring Data Mongo，你可以注入com.mongodb.Mongo bean而不是使用MongoDbFactory。

如果要完全控制建立MongoDB连接，还可以声明自己的MongoDbFactory或Mongo Bean。

### MongoTemplate

Spring Data Mongo提供了一个[MongoTemplate](http://docs.spring.io/spring-data/mongodb/docs/current/api/org/springframework/data/mongodb/core/MongoTemplate.html) 类，它的设计与Spring非常类似

JdbcTemplate的。 和JdbcTemplate一样，Spring Boot会自动配置一个bean来简单地注入：

**import** org.springframework.beans.factory.annotation.Autowired; **import** org.springframework.data.mongodb.core.MongoTemplate; **import** org.springframework.stereotype.Component;

@Component

**public class** MyBean {

**private final** MongoTemplate mongoTemplate;

@Autowired

**public** MyBean(MongoTemplate mongoTemplate) {

**this**.mongoTemplate = mongoTemplate;

}

*// ...*

}

有关完整的详细信息，请参阅MongoOperations Javadoc。

### Spring Data MongoDB repositories

Spring Data包含对MongoDB的存储库支持。 和前面讨论的JPA库一样，基本的原则是查询是基于方法名自动为你构建的。

实际上，Spring Data JPA和Spring Data MongoDB共享相同的通用基础结构; 所以你可以从之前的JPA例子中，假设City现在是一个Mongo数据类而不是JPA @Entity，它将以相同的方式工作。

**package** com.example.myapp.domain;

**import** org.springframework.data.domain.\*;

**import** org.springframework.data.repository.\*;

**public interface** CityRepository **extends** Repository<City, Long> { Page<City> findAll(Pageable pageable);

City findByNameAndCountryAllIgnoringCase(String name, String country);

}

**Tip**

有关Spring Data MongoDB的完整详细信息，包括丰富的对象映射技术，请参阅[reference documentation](http://projects.spring.io/spring-data-mongodb/)。

### 嵌入式(Embedded) Mongo

Spring Boot为[Embedded Mongo](https://github.com/flapdoodle-oss/de.flapdoodle.embed.mongo)提供自动配置。 要在Spring Boot应用程序中使用它，请添加对de.flapdoodle.embed：de.flapdoodle.embed.mongo的依赖关系。

Mongo将监听的端口可以使用spring.data.mongodb.port属性进行配置。 要使用随机分配的空闲端口，请使用零值。 由MongoAutoConfiguration创建的MongoClient将被自动配置为使用随机分配的端口。

**Note**

如果您不配置自定义端口，默认情况下嵌入式支持将使用随机端口（而不是27017）。

如果在类路径中有SLF4J，Mongo产生的输出将自动路由到名为org.springframework.boot.autoconfigure.mongo.embedded.EmbeddedMongo的记录器。

## Neo4j

[Neo4j](http://neo4j.com/)是一个开放源代码的NoSQL图形数据库，它使用由一级关系相关的丰富的节点数据模型，比传统的rdbms方法更适合于连接大数据。 Spring Boot为使用Neo4j提供了一些便利，包括spring-boot-starter-data-neo4j“Starter”。

### 连接到 Neo4j database

你可以注入一个自动配置的Neo4jSession，Session或者Neo4jOperations实例，就像其他的Spring Bean一样。 默认情况下，实例将尝试使用localhost：7474连接到Neo4j服务器：

@Component

**public class** MyBean {

**private final** Neo4jTemplate neo4jTemplate; @Autowired

**public** MyBean(Neo4jTemplate neo4jTemplate) {

**this**.neo4jTemplate = neo4jTemplate;

}

*// ...*

}

您可以通过添加您自己的org.neo4j.ogm.config.Configuration @Bean来完全控制配置。 另外，添加一个类型为Neo4jOperations的@Bean会禁用自动配置。

您可以通过spring.data.neo4j.\* 属性配置用户和证书使用：

**spring.data.neo4j.uri**=http://my-server:7474 **spring.data.neo4j.username**=neo4j **spring.data.neo4j.password**=secret

### 使用嵌入式模式( embedded mode)

如果将org.neo4j：neo4j-ogm-embedded-driver添加到应用程序的依赖项中，Spring Boot将自动配置Neo4j的进程内嵌入实例，在应用程序关闭时不会保留任何数据。 您可以使用spring.data.neo4j.embedded.enabled = false显式禁用该模式。 您也可以为嵌入模式启用持久性：

spring.data.neo4j.uri=file://var/tmp/graph.db

**Note**

Neo4j OGM嵌入式驱动程序不提供Neo4j内核。 用户需要手动提供这种依赖关系，请参阅文档以获取更多详细信息[the documentation](http://neo4j.com/docs/ogm-manual/current/reference/#reference%3Agetting-started) 。

### Neo4jSession

默认情况下，如果您正在运行Web应用程序，则会话将被绑定到线程以进行整个请求处理（即“在会话中打开会话”模式）。 如果您不想要这种行为，请将以下内容添加到application.properties中：

spring.data.neo4j.open-in-view=false

### Spring Data Neo4j repositories

Spring数据包括Neo4j的存储库支持。

实际上，Spring Data JPA和Spring Data Neo4j共享相同的通用基础结构; 所以你可以从之前的JPA例子中，假设City现在是一个Neo4j OGM @NodeEntity而不是JPA @Entity，它将以相同的方式工作。

**Tip**

您可以使用@EntityScan注解自定义实体扫描位置。

要启用存储库支持（并可选择支持@Transactional），请将以下两个注释添加到Spring配置中：

@EnableNeo4jRepositories(basePackages = "com.example.myapp.repository") @EnableTransactionManagement

### Repository example

**package** com.example.myapp.domain;

**import** org.springframework.data.domain.\*;

**import** org.springframework.data.repository.\*;

**public interface** CityRepository **extends** GraphRepository<City> { Page<City> findAll(Pageable pageable);

City findByNameAndCountry(String name, String country);

}

**Tip**

有关Spring Data Neo4j的完整详细信息，包括丰富的对象映射技术，请参阅[reference documentation](http://projects.spring.io/spring-data-neo4j/)。

## Gemfire

[Spring Data Gemfire](https://github.com/spring-projects/spring-data-gemfire) 为访问[Pivotal Gemfire](http://pivotal.io/big-data/pivotal-gemfire#details) 数据管理平台提供了方便Spring的工具。 有一个spring-boot-starter-data-gemfire“Starter”以方便的方式收集依赖关系。 目前没有Gemfire的自动配置支持，但是您可以使用[single annotation (@EnableGemfireRepositories)](https://github.com/spring-projects/spring-data-gemfire/blob/master/src/main/java/org/springframework/data/gemfire/repository/config/EnableGemfireRepositories.java)来启用Spring Data Repositories。

## Solr

[Apache Solr](http://lucene.apache.org/solr/) 是一个搜索引擎。 Spring Boot为Solr 5客户端库和[Spring Data Solr](https://github.com/spring-projects/spring-data-solr)提供的抽象类提供基本的自动配置。 有一个spring-boot-starter-data-solr'Starter'用于以一种方便的方式收集依赖关系。

### 连接到 Solr

您可以像其他任何Spring bean一样注入自动配置的SolrClient实例。 默认情况下，实例将尝试使用localhost:8983/solr:

@Component

**public class** MyBean {

**private** SolrClient solr; @Autowired

**public** MyBean(SolrClient solr) {

**this**.solr = solr;

}

*// ...*

}

如果你添加一个你自己的SolrClient类型的@Bean，它将会替换默认值。

### Spring Data Solr repositories

Spring Data包含Apache Solr的存储库支持。 和前面讨论的JPA库一样，基本的原则是查询是基于方法名自动为你构建的。

实际上，Spring Data JPA和Spring Data Solr共享相同的通用基础结构; 所以你可以从之前的JPA例子中，假设City现在是@SolrDocument类而不是JPA @Entity，它将以相同的方式工作。

**Tip**

有关Spring Data Solr的完整详细信息，请参阅其参考文档[reference documentation](http://projects.spring.io/spring-data-solr/)。

## Elasticsearch

[Elasticsearch](http://www.elasticsearch.org/) 是一个开源的，分布式的实时搜索和分析引擎。 Spring Boot为弹性数据Elasticsearch提供的Elasticsearch和抽象类提供了基本的自动配置[Spring Data](https://github.com/spring-projects/spring-data-elasticsearch) [Elasticsearch](https://github.com/spring-projects/spring-data-elasticsearch)。 有一个spring-boot-starter-data-elasticsearch“Starter”用于以一种方便的方式收集依赖关系。 Spring Boot也支持[Jest](https://github.com/searchbox-io/Jest)。

### 使用Jest连接到 Elasticsearch

如果你在类路径上有Jest，你可以注入一个自动配置的JestClient目标

默认为 localhost:9200。 您可以进一步调整客户端的配置方式：

**spring.elasticsearch.jest.uris**=http://search.example.com:9200 **spring.elasticsearch.jest.read-timeout**=10000 **spring.elasticsearch.jest.username**=user **spring.elasticsearch.jest.password**=secret

您还可以注册任意数量的实现HttpClientConfigBuilderCustomizer的bean，以实现更高级的自定义。 下面的例子调整额外的HTTP设置：

**static class** HttpSettingsCustomizer **implements** HttpClientConfigBuilderCustomizer {

@Override

**public void** customize(HttpClientConfig.Builder builder) { builder.maxTotalConnection(100).defaultMaxTotalConnectionPerRoute(5);

}

}

要完全控制注册，请定义一个JestClient bean。

### 使用 Spring Data 连接到 Elasticsearch

您可以注入自动配置的ElasticsearchTemplate或Elasticsearch Client实例，就像您使用其他Spring Bean一样。 默认情况下，实例将嵌入一个本地内存服务器（Elasticsearch术语中的一个节点），并使用当前工作目录作为服务器的主目录。 在这个设置中，首先要做的是告诉Elasticsearch在哪里存储文件：

**spring.data.elasticsearch.properties.path.home**=/foo/bar

或者，您可以通过设置切换到远程服务器（即TransportClient）

将spring.data.elasticsearch.cluster-nodes复制到冒号分隔(comma-separated)的“host：port”列表中。

**spring.data.elasticsearch.cluster-nodes**=localhost:9300

@Component

**public class** MyBean {

**private** ElasticsearchTemplate template; @Autowired

**public** MyBean(ElasticsearchTemplate template) {

**this**.template = template;

}

*// ...*

}

如果你添加一个你自己的ElasticsearchTemplate类型的@Bean，它将取代默认值。

### Spring Data Elasticsearch repositories

Spring Data包含Elasticsearch的存储库支持。 和前面讨论的JPA库一样，基本的原则是查询是基于方法名自动为你构建的。

实际上，Spring Data JPA和Spring Data Elasticsearch共享相同的通用基础结构; 所以你可以从之前的JPA例子中，假设City现在是Elasticsearch @Document类而不是JPA @Entity，它将以相同的方式工作。

**Tip**

有关Spring Data Elasticsearch的完整详细信息，请参阅其参考文档[reference documentation](http://docs.spring.io/spring-data/elasticsearch/docs/)。

## Cassandra

[Cassandra](http://cassandra.apache.org/)是一个开源的分布式数据库管理系统，用于处理大量商品服务器上的大量数据。 Spring Boot提供了Cassandra的自动配置和[Spring Data Cassandra](https://github.com/spring-projects/spring-data-cassandra)提供的抽象。 有一个spring-boot-starter-data-cassandra“Starter”用于以一种方便的方式收集依赖关系

### 连接到 Cassandra

您可以像使用其他Spring Bean一样注入自动配置的CassandraTemplate或Cassandra Session实例。 spring.data.cassandra.\* 属性可用于定制连接。 一般来说，您将提供keyspace-name 和 contact-points属性：

**spring.data.cassandra.keyspace-name**=mykeyspace **spring.data.cassandra.contact-points**=cassandrahost1,cassandrahost2

@Component

**public class** MyBean {

**private** CassandraTemplate template; @Autowired

**public** MyBean(CassandraTemplate template) {

**this**.template = template;

}

*// ...*

}

如果你添加一个类型为CassandraTemplate的@Bean，它将会替换默认的。

### Spring Data Cassandra repositories

Spring Data包含对Cassandra的基本存储库支持。 目前这比前面讨论的JPA库更有限，并且需要使用@Query注释finder方法。

**Tip**

有关Spring Data Cassandra的完整详细信息，请参阅其参考文档[reference documentation](http://docs.spring.io/spring-data/cassandra/docs/)。

## Couchbase

[Couchbase](http://www.couchbase.com/)是一个开源的分布式多模型NoSQL面向文档的数据库，针对交互式应用进行了优化。 Spring Boot提供了Couchbase的自动配置和[Spring Data Couchbase](https://github.com/spring-projects/spring-data-couchbase)提供的抽象。 有一个spring-boot-starter-data-couchbase“Starter”，用于以一种方便的方式收集依赖关系

### 连接到 Couchbase

通过添加Couchbase SDK和一些配置，您可以非常轻松地获取Bucket和Cluster。 spring.couchbase.\*属性可用于定制连接。 一般你会提供引导主机，存储bucket名称和密码：

**spring.couchbase.bootstrap-hosts**=my-host-1,192.168.1.123 **spring.couchbase.bucket.name**=my-bucket **spring.couchbase.bucket.password**=secret

**Tip**

您至少需要提供引导主机，在这种情况下，存储区名称是默认的，密码是空字符串。 或者，你可以定义你自己的org.springframework.data.couchbase.config.CouchbaseConfigurer @Bean控制整个配置。

还可以自定义一些CouchbaseEnvironment设置。 例如，以下配置更改用于打开新Bucket并启用SSL支持的超时：

**spring.couchbase.env.timeouts.connect**=3000 **spring.couchbase.env.ssl.key-store**=/location/of/keystore.jks **spring.couchbase.env.ssl.key-store-password**=secret

检查spring.couchbase.env.\*属性以获取更多详细信息。

### Spring Data Couchbase repositories

Spring Data包含Couchbase的存储库支持。 有关Spring Data Couchbase的完整详细信息，请参阅其参考文档[reference documentation](http://docs.spring.io/spring-data/couchbase/docs/current/reference/html/)。

只要默认的CouchbaseConfigurer可用（如上所述启用了couchbase支持时发生的情况），您可以像使用其他Spring Bean一样注入一个自动配置的CouchbaseTemplate实例。

@Component

**public class** MyBean {

**private final** CouchbaseTemplate template; @Autowired

**public** MyBean(CouchbaseTemplate template) {

**this**.template = template;

}

*// ...*

}

您可以在自己的配置中定义几个bean来覆盖自动配置提供的bean：

* 名为couchbaseTemplate的CouchbaseTemplate @Bean
* 名为couchbaseIndexManager的IndexManager @ Bean
* 名为couchbaseCustomConversions的CustomConversions @Bean

为了避免在自己的配置中对这些名称进行硬编码(hard-coding)，可以重用Spring Data Couchbase提供的BeanNames。 例如，您可以自定义转换器使用如下：

@Configuration

**public class** SomeConfiguration {

@Bean(BeanNames.COUCHBASE\_CUSTOM\_CONVERSIONS)

**public** CustomConversions myCustomConversions() {

**return new** CustomConversions(...);

}

*// ...*

}

**Tip**

如果您想完全绕过Spring Data Couchbase的自动配置，请提供您自己的org.springframework.data.couchbase.config.AbstractCouchbaseDataConfiguration实现。

## LDAP

[LDAP](https://en.wikipedia.org/wiki/Lightweight_Directory_Access_Protocol) （轻量级目录访问协议）是一种开放的，厂商中立的行业标准应用协议，用于通过IP网络访问和维护分布式目录信息服务。 Spring Boot为任何兼容的LDAP服务器提供自动配置，并支持来自[UnboundID](https://www.ldap.com/unboundid-ldap-sdk-for-java)的嵌入式内存LDAP服务器

[Spring Data LDAP](https://github.com/spring-projects/spring-data-ldap)提供LDAP抽象。 有一个spring-boot-starter-data-ldap“Starter”，用于方便地收集依赖关系。

### 连接到 LDAP server

要连接到LDAP服务器，请确保您声明了对spring-boot-starter-data-ldap“Starter”或spring-ldap-core的依赖关系，然后在application.properties中声明您的服务器的URL：

**spring.ldap.urls**=ldap://myserver:1235 **spring.ldap.username**=admin **spring.ldap.password**=secret

如果你需要自定义连接设置，你可以使用spring.ldap.base和spring.ldap.base-environment属性。

### Spring Data LDAP repositories

Spring Data包含LDAP的存储库支持。 有关Spring Data LDAP的完整详细信息，请参阅其参考文档。

Spring Data includes repository support for LDAP. For complete details of Spring Data LDAP, refer to their [reference documentation](http://docs.spring.io/spring-data/ldap/docs/1.0.x/reference/html/).

您也可以像使用其他Spring Bean一样注入自动配置的LdapTemplate实例。

@Component

**public class** MyBean {

**private final** LdapTemplate template; @Autowired

**public** MyBean(LdapTemplate template) {

**this**.template = template;

}

*// ...*

}

### 嵌入式 in-memory LDAP server

出于测试目的，Spring Boot支持从[UnboundID](https://www.ldap.com/unboundid-ldap-sdk-for-java)自动配置内存中的LDAP服务器。 要配置服务器，请向com.unboundid：unboundid-ldapsdk添加一个依赖项，并声明一个base-dn属性：

**spring.ldap.embedded.base-dn**=dc=spring,dc=io

默认情况下，服务器将在随机端口上启动，并触发常规的LDAP支持（不需要指定spring.ldap.urls属性）。

如果你的类路径中有一个schema.ldif文件，它将被用来初始化服务器。 如果要从其他资源加载初始化脚本，也可以使用spring.ldap.embedded.ldif属性。

默认情况下，将使用标准架构来验证LDIF文件，您可以使用spring.ldap.embedded.validation.enabled属性完全关闭验证。 如果您有自定义属性，则可以使用spring.ldap.embedded.validation.schema来定义自定义属性类型或对象类。

# Caching

Spring框架提供了对应用程序透明地添加缓存的支持。 其核心是抽象将缓存应用于方法，从而根据缓存中可用的信息减少执行次数。 缓存逻辑是透明应用的，对调用者没有任何干扰。 只要通过@EnableCaching批注启用缓存支持，Spring Boot就会自动配置缓存基础结构。

**Note**

查看Spring Framework参考的相关部分[relevant section](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#cache) 以获取更多详细信息。

简而言之，将缓存添加到服务的操作中，就像将相关的注释添加到其方法一样简单：

**import** org.springframework.cache.annotation.Cacheable

**import** org.springframework.stereotype.Component;

@Component

**public class** MathService {

@Cacheable("piDecimals")

**public int** computePiDecimal(**int** i) {

*// ...*

}

}

这个例子演示了如何在一个潜在的代价高昂的操作上使用缓存。 在调用computePiDecimal之前，抽象将在匹配 i 参数的piDecimals缓存中查找条目。 如果找到一个条目，则缓存中的内容立即返回给调用者，并且该方法不被调用。 否则，在返回值之前调用该方法并更新缓存。

**Note**

您也可以透明地使用标准的JSR-107（JCache）注释（例如@CacheResult）。 我们强烈建议您不要混淆和匹配。

如果你不添加任何特定的缓存库，Spring Boot会自动配([Simple provider](#_bookmark226) )一个在内存中使用并发映射的简单提供程序。 当需要缓存的时候（例如上面的例子中的piDecimals），这个提供者将会为你创建它。 简单的提供者并不是真正被推荐用于生产用途，但是对于入门和确保理解这些特性来说是非常好的。 当您决定使用缓存提供程序时，请确保阅读其文档以了解如何配置应用程序使用的缓存。 实际上，所有提供程序都要求您显式配置在应用程序中使用的每个缓存。 有些提供了一种自定义由spring.cache.cache-names属性定义的默认缓存的方法。

**Tip**

透明地[update](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#cache-annotations-put) 或 [evict](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#cache-annotations-evict) 缓存中的数据也是可能的。

**Note**

如果您正在使用非基于接口的Bean的缓存基础结构，请确保启用@EnableCaching的proxyTargetClass属性。

## Supported cache providers

缓存抽象不提供实际的存储，并依赖于由org.springframework.cache.Cache和org.springframework.cache.CacheManager接口实现的抽象。

如果您尚未定义类型为CacheManager的Bean或名为cacheResolver的CacheResolver

（请参阅CachingConfigurer），Spring Boot尝试检测以下提供程序（按此顺序）：

* [Generic](#_bookmark217)
* [JCache (JSR-107)](#_bookmark218) (EhCache 3, Hazelcast, Infinispan, etc)
* [EhCache 2.x](#_bookmark219)
* [Hazelcast](#_bookmark220)
* [Infinispan](#_bookmark221)
* [Couchbase](#_bookmark222)
* [Redis](#_bookmark223)
* [Caffeine](#_bookmark224)
* [Guava](#_bookmark225) (deprecated)
* [Simple](#_bookmark226)

**Tip**

也可以通过spring.cache.type属性来强制缓存提供者使用。 如果您需要在特定环境（例如测试）中完全禁用缓存[disable caching altogether](#_bookmark227) ，请使用此属性。

**Tip**

使用spring-boot-starter-cache“Starter”快速添加基本的缓存依赖关系。 初学者引入了spring-context-support：如果你手动添加依赖项，你必须包含spring-context-support才能使用JCache，EhCache 2.x或者Guava支持。

如果CacheManager是由Spring Boot自动配置的，那么可以通过公开一个实现CacheManagerCustomizer接口的bean来完全初始化它的配置。 以下设置一个标志来表示空值应该传递给底层的地图(map)。

@Bean

**public** CacheManagerCustomizer<ConcurrentMapCacheManager> cacheManagerCustomizer() {

**return new** CacheManagerCustomizer<ConcurrentMapCacheManager>() { @Override

**public void** customize(ConcurrentMapCacheManager cacheManager) { cacheManager.setAllowNullValues(false);

}

};

}

**Note**

在上面的例子中，需要一个自动配置的ConcurrentMapCacheManager。 如果不是这种情况（要么提供自己的配置，要么自动配置不同的缓存提供程序），定制程序根本不会被调用。 您可以拥有任意数量的定制器，您也可以像往常一样使用@Order 或 Ordered来定购它们。

### Generic

如果上下文定义了至少一个org.springframework.cache.Cache，则使用通用cache bean。

包含所有类型的Bean的CacheManager被创建。

### JCache (JSR-107)

通过类路径上的javax.cache.spi.CachingProvider（即符合JSR-107的高速缓存库）和由spring-boot-starter-cache“Starter”提供的JCacheCacheManager来引导JCache。 在那里有各种兼容的库，Spring Boot提供Ehcache 3，Hazelcast和Infinispan的依赖管理。 任何其他兼容的库也可以添加。

可能会出现多个供应商存在的情况，在这种情况下，供应商必须明确指定。 即使JSR-107标准没有强制规定配置文件的位置，Spring Boot也会尽力满足实现细节。

*# Only necessary if more than one provider is present* **spring.cache.jcache.provider**=com.acme.MyCachingProvider **spring.cache.jcache.config**=classpath:acme.xml

**Note**

由于缓存库可能提供本地实现和JSR-107支持，因此Spring Boot将更喜欢JSR-107支持，因此如果切换到不同的JSR-107实现，则可以使用相同的功能。

**Tip**

Spring Boot对Hazelcast有广泛的支持[general support for Hazelcast](#_bookmark254)。 如果有一个HazelcastInstance可用，那么它将自动重用于CacheManager，除非指定了spring.cache.jcache.config属性。

有几种方法可以自定义底层的javax.cache.cacheManager：

* 可以通过spring.cache.cache-names属性在启动时创建缓存。 如果自定义定义了javax.cache.configuration.Configuration bean，用它来定制它们。
* org.springframework.boot.autoconfigure.cache.JCacheManagerCustomizer bean将通过CacheManager的引用进行调用，以实现完全自定义。

**Tip**

如果定义了一个标准的javax.cache.CacheManager bean，它将自动包装在抽象所期望的org.springframework.cache.CacheManager实现中。 没有进一步的定制应用于此。

### EhCache 2.x

如果可以在类路径的根目录中找到名为ehcache.xml的文件，则使用EhCache 2.x。 如果EhCache 2.x，由spring-boot-starter-cache“Starter”提供的EhCacheCacheManager和这样的文件存在，它将被用来引导缓存管理器。 备用配置文件也可以使用：

**spring.cache.ehcache.config**=classpath:config/another-config.xml

### Hazelcast

[general support for Hazelcast](#_bookmark254)有广泛的支持。 如果HazelcastInstance已被自动配置，它会自动包装在CacheManager中。

### Infinispan

Infinispan没有默认配置文件位置，因此必须明确指定（或使用默认引导程序）。

**spring.cache.infinispan.config**=infinispan.xml

可以通过spring.cache.cache-names属性在启动时创建缓存。 如果自定义

定义了ConfigurationBuilder bean，用它来定制它们。

**Note**

Infinispan在Spring Boot中的支持仅限于嵌入式模式，非常基础。 如果您需要更多的选项，则应该使用官方的Infinispan Spring Boot启动器，请查阅文档the documentation以获取更多详细信息。

### Couchbase

如果Couchbase Java客户端和couchbase-spring-cache实现可用，并且Couchbase已配置[configured](#_bookmark208)，则将自动配置CouchbaseCacheManager。 也可以使用spring.cache.cache-names属性在启动时创建额外的缓存。 这些将在自动配置的Bucket上运行。 您还可以使用定制器在另一个存储Bucket上创建更多的高速缓存：假设您需要“主”存储Bucket（foo和bar）上的两个高速缓存以及一个定制时间在另一个存储Bucket上存活2秒的高速缓存。 首先，您可以简单地通过配置创建两个第一个缓存：

**spring.cache.cache-names**=foo,bar

然后定义这个额外的@Configuration来配置额外的Bucket和biz缓存：

@Configuration

**public class** CouchbaseCacheConfiguration {

**private final** Cluster cluster;

**public** CouchbaseCacheConfiguration(Cluster cluster) {

**this**.cluster = cluster;

}

@Bean

**public** Bucket anotherBucket() {

**return this**.cluster.openBucket(***"another"***, ***"secret"***);

}

@Bean

**public** CacheManagerCustomizer<CouchbaseCacheManager> cacheManagerCustomizer() {

**return** c -> {

c.prepareCache(***"biz"***, CacheBuilder.newInstance(anotherBucket())

.withExpiration(2));

};

}

}

此示例配置重用通过自动配置创建的群集。

### Redis

如果Redis可用且已配置，则RedisCacheManager将自动配置。 也可以使用spring.cache.cache-names属性在启动时创建额外的缓存。

**Note**

默认情况下，添加一个关键字前缀，以防止如果两个单独的缓存使用相同的密钥，Redis将有重叠的键，并可能返回无效的值。 如果您创建自己的RedisCacheManager，我们强烈建议您保持启用此设置。

### Caffeine

Caffeine是Guava缓存的Java 8重写，将取代Spring Boot 2.0中的Guava支持。 如果存在Caffeine，CaffeineCacheManager（由spring-boot-starter-cache'Starter'提供）将自动配置。 可以使用spring.cache.cachename属性在启动时创建缓存，并按以下顺序（按此顺序）进行自定义：

1. 由spring.cache.caafeine.spec定义的缓存规范
2. 定义了一个com.github.benmanes.caffeine.cache.CaffeineSpec bean
3. 定义了com.github.benmanes.cafeine.cache.Caffeine bean

例如，以下配置会创建一个最大大小为500的foo和bar高速缓存，并且生存时间为10分钟

**spring.cache.cache-names**=foo,bar **spring.cache.caffeine.spec**=maximumSize=500,expireAfterAccess=600s

另外，如果定义了一个com.github.benmanes.caffeine.cache.CacheLoader bean，它会自动关联到CaffeineCacheManager。 由于CacheLoader将与缓存管理器管理的所有缓存关联，因此必须将其定义为CacheLoader <Object，Object>。 任何其他泛型类型将被自动配置忽略。

### Guava (deprecated)

如果存在Guava，GuavaCacheManager将自动配置。 可以使用spring.cache.cache-names属性在启动时创建缓存，并按以下顺序（按此顺序）进行自定义：

1. 由spring.cache.guava.spec定义的缓存规范
2. 定义了com.google.common.cache.CacheBuilderSpec bean
3. 定义com.google.common.cache.CacheBuilder bean

例如，以下配置会创建一个最大大小为500的foo和bar高速缓存，并且生存时间为10分钟

**spring.cache.cache-names**=foo,bar **spring.cache.guava.spec**=maximumSize=500,expireAfterAccess=600s

另外，如果定义了com.google.common.cache.CacheLoader bean，它将自动关联到GuavaCacheManager。 由于CacheLoader将与缓存管理器管理的所有缓存关联，因此必须将其定义为CacheLoader <Object，Object>。 任何其他泛型类型将被自动配置忽略。

### Simple

如果找不到任何其他提供者，则配置使用ConcurrentHashMap作为缓存存储的简单实现。 如果应用程序中没有缓存库，则这是默认值。 高速缓存默认是即时创建的，但您可以使用cache-names属性来限制可用高速缓存的列表。 例如，如果你只想要foo和bar高速缓存：

**spring.cache.cache-names**=foo,bar

如果你这样做，并且你的应用程序使用未列出的缓存，那么在需要缓存时运行时会失败，但在启动时不会运行。 这与“real”缓存提供程序在使用未声明的缓存时的行为方式类似。

### None

当@EnableCaching出现在您的配置中时，也会有一个合适的缓存配置。 如果您需要在某些环境中完全禁用缓存，则强制缓存类型为none，以使用无操作的实现：

**spring.cache.type**=none

# Messaging

Spring框架为消息系统集成提供了广泛的支持：从使用JmsTemplate的JMS API的简化使用到异步接收消息的完整基础结构。 Spring AMQP为“高级消息队列协议”提供了类似的功能，Spring Boot也为RabbitTemplate和RabbitMQ提供了自动配置选项。 在Spring WebSocket中也支持STOMP消息本身，Spring Boot通过启动器和少量的自动配置支持。 Spring Boot也支持Apache Kafka。

## JMS

javax.jms.ConnectionFactory接口提供了一个创建javax.jms.Connection的标准方法，用于与JMS代理进行交互。 尽管Spring需要一个ConnectionFactory来处理JMS，但通常不需要直接使用它，而是可以依赖更高级别的消息抽象（请参阅Spring Framework参考文档[relevant section](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#jms) 的相关章节以获取详细信息）。 Spring Boot还会自动配置发送和接收消息的必要基础结构。

### ActiveMQ support

当Spring Boot检测到ActiveMQ在类路径中可用时，也可以配置ConnectionFactory。 如果代理存在，则会自动启动并配置嵌入式代理（只要未通过配置指定代理URL）。

**Note**

如果您使用的是spring-boot-starter-activemq，则提供必要的依赖关系来连接或嵌入ActiveMQ实例，以及Spring基础结构以与JMS集成。

ActiveMQ配置由spring.activemq.\*中的外部配置属性控制。 例如，您可以在application.properties中声明以下部分：

**spring.activemq.broker-url**=tcp://192.168.1.210:9876 **spring.activemq.user**=admin **spring.activemq.password**=secret

您还可以通过向org.apache.activemq：activemq- pool添加依赖项来合并JMS资源，并相应地配置PooledConnectionFactory：

**spring.activemq.pool.enabled**=true **spring.activemq.pool.max-connections**=50

**Tip**

请参阅[ActiveMQProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jms/activemq/ActiveMQProperties.java) 以获取更多受支持的选项。 您还可以注册任意数量的实现ActiveMQConnectionFactoryCustomizer的bean以进行更高级的自定义。

默认情况下，如果ActiveMQ不存在，ActiveMQ将创建一个目标，因此目标将根据其提供的名称进行解析。

### Artemis support

当Spring Boot检测到Artemis在类路径中可用时，它可以自动配置一个ConnectionFactory。 如果代理存在，则会自动启动并配置嵌入式代理（除非已明确设置mode属性）。 支持的模式有：嵌入式（明确规定嵌入式代理是必需的，如果代理在类路径中不可用，则会导致错误），本地代理使用netty传输协议连接到代理。 当配置后者时，Spring Boot会使用默认设置配置一个连接到本地机器上运行的代理的ConnectionFactory。

**Note**

如果您使用的是spring-boot-starter-artemis，则必须提供连接到现有Artemis实例的依赖关系，以及Spring基础结构以与JMS集成。 将org.apache.activemq：artemis-jms-server添加到您的应用程序允许您使用嵌入模式。

Artemis配置由spring.artemis.\*中的外部配置属性控制。 例如，您可以在application.properties中声明以下部分：

**spring.artemis.mode**=native **spring.artemis.host**=192.168.1.210 **spring.artemis.port**=9876 **spring.artemis.user**=admin **spring.artemis.password**=secret

在嵌入代理时，可以选择是否要启用持久性，以及应该使其可用的目标列表。 这些可以被指定为冒号号分隔的列表，以使用默认选项创建它们; 也可以分别为高级队列和主题配置定义org.apache.activemq.artemis.jms.server.config.JMSQueueConfiguration

或org.apache.activemq.artemis.jms.server.config.TopicConfiguration类型的bean。

请参阅[ArtemisProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jms/artemis/ArtemisProperties.java) 获取更多支持的选项。

根本不涉及任何JNDI查找，并且使用Artemis配置中的“name”属性或通过配置提供的名称来解析目的地的名称。

### 使用 JNDI ConnectionFactory

如果您正在应用程序服务器中运行应用程序，Spring Boot将尝试使用JNDI查找JMS ConnectionFactory。 默认情况下，将检查位置java：/ JmsXA和java：/ XAConnectionFactory。 如果您需要指定替代位置，则可以使用spring.jms.jndi-name属性：

**spring.jms.jndi-name**=java:/MyConnectionFactory

### Sending a message

Spring的JmsTemplate是自动配置的，你可以直接将它自动装入到你自己的bean中：

**import** org.springframework.beans.factory.annotation.Autowired;

**import** org.springframework.jms.core.JmsTemplate;

**import** org.springframework.stereotype.Component;

@Component

**public class** MyBean {

**private final** JmsTemplate jmsTemplate; @Autowired

**public** MyBean(JmsTemplate jmsTemplate) {

**this**.jmsTemplate = jmsTemplate;

}

*// ...*

}

**Note**

[JmsMessagingTemplate](http://docs.spring.io/spring/docs/4.3.12.RELEASE/javadoc-api/org/springframework/jms/core/JmsMessagingTemplate.html) 可以以类似的方式注入。 如果定义了DestinationResolver或MessageConverter Bean，它们将自动关联到自动配置的JmsTemplate。

### Receiving a message

当存在JMS基础结构时，可以使用@JmsListener对任何bean进行注释以创建侦听器端点。 如果没有定义JmsListenerContainerFactory，则会自动配置一个默认的JmsListenerContainerFactory。 如果定义了DestinationResolver或MessageConverter Bean，它们将自动关联到默认工厂。

默认工厂默认是事务性的。 如果您正在JtaTransactionManager存在的基础架构中运行，则默认情况下它将关联到侦听器容器。 如果不是，sessionTransacted标志将被启用。 在后一种情况下，您可以通过在侦听器方法（或其代理）上添加@Transactional来将本地数据存储事务与传入消息的处理关联起来。 这将确保一旦本地事务完成，传入消息就被确认。 这还包括发送已在相同的JMS会话上执行的响应消息。

以下组件在someQueue目标上创建侦听器端点：

@Component

**public class** MyBean {

@JmsListener(destination = "someQueue")

**public void** processMessage(String content) {

*// ...*

}

}

**Tip**

查看[the Javadoc of @EnableJms](http://docs.spring.io/spring/docs/4.3.12.RELEASE/javadoc-api/org/springframework/jms/annotation/EnableJms.html) 获取更多细节。

如果您需要创建更多的JmsListenerContainerFactory实例，或者您想要覆盖默认值，Spring Boot会提供一个DefaultJmsListenerContainerFactoryConfigurer，您可以使用它来初始化DefaultJmsListenerContainerFactory，其设置与自动配置的设置相同。

例如，下面公开了使用特定MessageConverter的另一个工厂：

@Configuration

**static class** JmsConfiguration {

@Bean

**public** DefaultJmsListenerContainerFactory myFactory( DefaultJmsListenerContainerFactoryConfigurer configurer) {

DefaultJmsListenerContainerFactory factory =

**new** DefaultJmsListenerContainerFactory(); configurer.configure(factory, connectionFactory()); factory.setMessageConverter(myMessageConverter()); **return** factory;

}

}

那么你可以在任何@ JmsListener-annotatated的方法中使用，如下所示：

@Component

**public class** MyBean {

@JmsListener(destination = ***"someQueue"***, **containerFactory="myFactory"**) **public void** processMessage(String content) {

*// ...*

}

}

## AMQP

高级消息队列协议（AMQP）是面向消息中间件的平台中立的有线协议。 Spring AMQP项目将核心Spring概念应用于基于AMQP的消息传递解决方案的开发。 Spring Boot通过RabbitMQ为AMQP提供了一些便利，包括spring-boot-starter-amqp'Starter'。

### RabbitMQ support

RabbitMQ是一个基于AMQP协议的轻量级，可靠，可扩展和可移植的消息代理。 Spring使用RabbitMQ使用AMQP协议进行通信。

RabbitMQ配置由spring.rabbitmq.\* 中的外部配置属性控制。 例如，您可以在application.properties中声明以下部分：

**spring.rabbitmq.host**=localhost **spring.rabbitmq.port**=5672 **spring.rabbitmq.username**=admin **spring.rabbitmq.password**=secret

请参阅[RabbitProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/amqp/RabbitProperties.java) 获取更多支持的选项。

**Tip**

检查了解[Understanding AMQP, the protocol used by RabbitMQ](http://spring.io/blog/2010/06/14/understanding-amqp-the-protocol-used-by-rabbitmq/) 使用的协议了解更多细节。

### Sending a message

Spring的AmqpTemplate和AmqpAdmin是自动配置的，你可以直接将它们自动装入自己的bean中：

**import** org.springframework.amqp.core.AmqpAdmin;

**import** org.springframework.amqp.core.AmqpTemplate;

**import** org.springframework.beans.factory.annotation.Autowired;

**import** org.springframework.stereotype.Component;

@Component

**public class** MyBean {

**private final** AmqpAdmin amqpAdmin;

**private final** AmqpTemplate amqpTemplate;

@Autowired

**public** MyBean(AmqpAdmin amqpAdmin, AmqpTemplate amqpTemplate) {

**this**.amqpAdmin = amqpAdmin;

**this**.amqpTemplate = amqpTemplate;

}

*// ...*

}

**Note**

[RabbitMessagingTemplate](http://docs.spring.io/spring-amqp/docs/current/api/org/springframework/amqp/rabbit/core/RabbitMessagingTemplate.html) 可以以类似的方式注入。 如果是一个MessageConverter

bean被定义，它会自动关联到自动配置的AmqpTemplate。

任何定义为bean的org.springframework.amqp.core.Queue将自动用于在RabbitMQ实例上声明相应的队列（如有必要）。

您可以在AmqpTemplate上启用重试以重试操作，例如在代理连接丢失的情况下。 重试是默认禁用的。

### Receiving a message

当存在Rabbit基础结构时，可以使用@RabbitListener对任何bean进行注释以创建一个侦听器端点。 如果没有定义RabbitListenerContainerFactory，则会自动配置一个默认的RabbitListenerContainerFactory。 如果定义了MessageConverter或MessageRecoverer bean，它们将自动关联到默认工厂。

以下组件在someQueue队列上创建一个侦听器端点：

@Component

**public class** MyBean {

@RabbitListener(queues = "someQueue")

**public void** processMessage(String content) {

*// ...*

}

}

**Tip**

查看the Javadoc of @EnableRabbit获取更多细节。

如果您需要创建更多的RabbitListenerContainerFactory实例，或者您想要覆盖默认值，Spring Boot会提供一个SimpleRabbitListenerContainerFactoryConfigurer，您可以使用它来初始化一个与自动配置的设置相同的SimpleRabbitListenerContainerFactory。

例如，下面公开了使用特定MessageConverter的另一个工厂：

@Configuration

**static class** RabbitConfiguration {

@Bean

**public** SimpleRabbitListenerContainerFactory myFactory( SimpleRabbitListenerContainerFactoryConfigurer configurer) {

SimpleRabbitListenerContainerFactory factory =

**new** SimpleRabbitListenerContainerFactory(); configurer.configure(factory, connectionFactory); factory.setMessageConverter(myMessageConverter()); **return** factory;

}

}

那么你可以在任何@ RabbitListener注释的方法中使用，如下所示：

@Component

**public class** MyBean {

@RabbitListener(queues = ***"someQueue"***, **containerFactory="myFactory"**) **public void** processMessage(String content) {

*// ...*

}

}

您可以启用重试来处理侦听器引发异常的情况。 默认使用RejectAndDontRequeueRecoverer，但是你可以定义一个你自己的MessageRecoverer。 当重试耗尽时，如果代理配置如此，则该消息将被拒绝并丢弃或路由到死信交换。 重试是默认禁用的。

**Important**

如果重试未启用，并且侦听器引发异常，默认情况下，传递将无限期地重试。 您可以通过两种方式修改此行为; 将defaultRequeueRejected属性设置为false，并尝试零重新发送; 或者抛出一个AmqpRejectAndDontRequeueException异常来表明消息应该被拒绝。 这是启用重试并达到最大传送次数时使用的机制。

## Apache Kafka Support

通过提供spring-kafka项目的自动配置来支持[Apache Kafka](http://kafka.apache.org/) 。

Kafka配置由spring.kafka.\* 中的外部配置属性控制。 例如，您可以在application.properties中声明以下部分：

**spring.kafka.bootstrap-servers**=localhost:9092 **spring.kafka.consumer.group-id**=myGroup

请参阅[KafkaProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/kafka/KafkaProperties.java) 获取更多支持的选项。

### Sending a Message

Spring的KafkaTemplate是自动配置的，你可以直接在你自己的bean中自动装配它们：

@Component

**public class** MyBean {

**private final** KafkaTemplate kafkaTemplate; @Autowired

**public** MyBean(KafkaTemplate kafkaTemplate) {

**this**.kafkaTemplate = kafkaTemplate;

}

*// ...*

}

### Receiving a Message

当存在Apache Kafka基础结构时，任何bean都可以使用@KafkaListener进行注释以创建侦听器端点。 如果没有定义KafkaListenerContainerFactory，则使用spring.kafka.listener.\* 中定义的键自动配置默认的一个。

以下组件在someTopic主题上创建侦听器端点：

@Component

**public class** MyBean {

@KafkaListener(topics = "someTopic")

**public void** processMessage(String content) {

*// ...*

}

}

### Additional Kafka Properties

[Appendix A, *Common application*](#_bookmark569)[*properties*](#_bookmark569)中显示了自动配置支持的属性。 请注意，这些属性（连字符或camelCase）大部分直接映射到Apache Kafka dotted属性，有关详细信息，请参阅Apache Kafka文档。

前面几个属性适用于生产者和消费者，但是如果你想为每个生产者和消费者使用不同的值，可以在生产者或消费者层面指定。 Apache Kafka指定重要属性：HIGH，MEDIUM和LOW。 Spring Boot自动配置支持所有HIGH重要性属性，一些选定的MEDIUM和LOW，以及任何没有默认值的属性。

Kafka支持的属性只有一部分可以通过KafkaProperties类获得。 如果您希望使用不直接支持的其他属性来配置生产者或消费者，请使用以下命令：

**spring.kafka.properties.foo.bar**=baz

这将常见的foo.bar Kafka属性设置为baz。

这些属性将由消费者和生产者工厂bean共享。 如果您希望使用不同的属性自定义这些组件，例如为每个属性使用不同的度量标准读取器，则可以覆盖这些bean定义，如下所示：

@Configuration

**public static class** CustomKafkaBeans {

**/\*\***

* **Customized ProducerFactory bean.**
* **@param properties the kafka properties.**

**\* @return the bean.**

**\*/**

@Bean

**public** ProducerFactory<?, ?> kafkaProducerFactory(KafkaProperties properties) { Map<String, Object> producerProperties = properties.buildProducerProperties(); producerProperties.put(CommonClientConfigs.METRIC\_REPORTER\_CLASSES\_CONFIG,

MyProducerMetricsReporter.**class**);

**return new** DefaultKafkaProducerFactory<Object, Object>(producerProperties);

}

**/\*\***

* **Customized ConsumerFactory bean.**
* **@param properties the kafka properties.**
* **@return the bean.**

**\*/**

@Bean

**public** ConsumerFactory<?, ?> kafkaConsumerFactory(KafkaProperties properties) { Map<String, Object> consumerProperties = properties.buildConsumerProperties(); consumerProperties.put(CommonClientConfigs.METRIC\_REPORTER\_CLASSES\_CONFIG,

MyConsumerMetricsReporter.**class**);

**return new** DefaultKafkaConsumerFactory<Object, Object>(consumerProperties);

}

}

# 调用 REST services

如果您需要从应用程序调用远程REST服务，则可以使用Spring Framework的RestTemplate类。 由于RestTemplate实例经常需要在使用之前进行定制，因此Spring Boot不提供任何自动配置的RestTemplate bean。 但是，它会自动配置一个RestTemplateBuilder，可以在需要时使用RestTemplateBuilder创建RestTemplate实例。 自动配置的RestTemplateBuilder将确保合理的HttpMessageConverters应用于RestTemplate实例。

这是一个典型的例子：

@Service

**public class** MyBean {

**private final** RestTemplate restTemplate;

**public** MyBean(RestTemplateBuilder restTemplateBuilder) {

**this**.restTemplate = restTemplateBuilder.build();

}

**public** Details someRestCall(String name) {

**return this**.restTemplate.getForObject(***"/{name}/details"***, Details.**class**, name);

}

}

**Tip**

RestTemplateBuilder包含许多有用的方法，可以用来快速配置RestTemplate。 例如，要添加BASIC认证支持，您可以使用builder.basicAuthorization（“user”，“password”）。build（）。

## 自定义 RestTemplate

RestTemplate自定义有三种主要方法，具体取决于您希望自定义应用的范围。

为了尽可能缩小任何自定义的范围，请注入自动配置的RestTemplateBuilder，然后根据需要调用其方法。 每个方法调用都会返回一个新的RestTemplateBuilder实例，所以自定义只会影响构建器的这种使用。

要进行应用程序范围application-wide的添加式定制，可以使用RestTemplateCustomizer bean。 所有这些bean都会自动注册到自动配置的RestTemplateBuilder中，并将应用于任何使用它构建的模板。

下面是一个定制器的例子，它为192.168.0.5以外的所有主机配置代理的使用：

**static class** ProxyCustomizer **implements** RestTemplateCustomizer {

@Override

**public void** customize(RestTemplate restTemplate) { HttpHost proxy = **new** HttpHost(***"proxy.example.com"***); HttpClient httpClient = HttpClientBuilder.create()

.setRoutePlanner(**new** DefaultProxyRoutePlanner(proxy) {

@Override

**public** HttpHost determineProxy(HttpHost target, HttpRequest request, HttpContext context)

**throws** HttpException {

**if** (target.getHostName().equals(***"192.168.0.5"***)) {

**return** null;

}

**return super**.determineProxy(target, request, context);

}

}).build(); restTemplate.setRequestFactory(

**new** HttpComponentsClientHttpRequestFactory(httpClient));

}

}

最后，最极端的（也是很少使用的）选项是创建你自己的RestTemplateBuilder bean。 这将关闭RestTemplateBuilder的自动配置，并阻止使用RestTemplateCustomizer bean。

# Validation

只要JSR-303实现（例如Hibernate验证器）位于类路径上，Bean Validation 1.1支持的方法验证功能就会自动启用。 这允许bean方法在其参数和/或返回值上使用javax.validation约束进行注释。 具有这种注释方法的目标类需要在类型级别使用@Validated注解进行注释，以便为其内联约束注释搜索它们的方法。

例如，下面的服务触发第一个参数的验证，确保它的大小在8到10之间

@Service @Validated

**public class** MyBean {

**public** Archive findByCodeAndAuthor(@Size(min = 8, max = 10) String code, Author author) {

...

}

}

# Sending email

Spring框架为使用JavaMailSender发送电子邮件提供了一个简单的抽象

界面和Spring Boot提供自动配置以及启动模块。

**Tip**

检查参考文档[reference documentation](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#mail)以获得如何使用的详细说明

JavaMailSender。

如果spring.mail.host和相关库（由spring-boot-starter-mail定义）可用，则创建默认的JavaMailSender（如果不存在）。 发件人可以通过spring.mail命名空间中的配置项进一步自定义，请参阅[MailProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/mail/MailProperties.java) 以获取更多详细信息。

特别是，某些默认的超时值是无限的，您可能想要更改该值以避免线程阻塞无响应的邮件服务器：

**spring.mail.properties.mail.smtp.connectiontimeout**=5000 **spring.mail.properties.mail.smtp.timeout**=3000 **spring.mail.properties.mail.smtp.writetimeout**=5000

# 分布式事务 JTA

Spring Boot使用[Atomikos](http://www.atomikos.com/) 或 [Bitronix](https://github.com/bitronix/btm)嵌入式事务管理器支持跨多个XA资源的分布式JTA事务。 在部署到合适的Java EE应用服务器时，也支持JTA事务。

当检测到JTA环境时，Spring的JtaTransactionManager将被用来管理事务。 自动配置的JMS，DataSource和JPA bean将被升级以支持XA事务。 你可以使用标准的Spring成语(idioms)例如@Transactional来参与分布式事务。 如果您处于JTA环境中并且仍想使用本地事务，则可以将spring.jta.enabled属性设置为false以禁用JTA自动配置。

## 使用 Atomikos transaction manager

Atomikos是一个流行的开源事务管理器，可以嵌入到Spring Boot应用程序中。 您可以使用spring-boot-starter-jta-atomikos启动器来引入相应的Atomikos库。 Spring Boot会自动配置Atomikos，并确保适当的依赖设置被应用到你的Spring bean，以便正确的启动和关闭顺序。

默认情况下，Atomikos事务日志将写入应用程序主目录（应用程序jar文件所在的目录）中的事务日志目录。 您可以通过在application.properties文件中设置spring.jta.log-dir属性来自定义此目录。 启动spring.jta.atomikos.properties的属性也可以用来定制Atomikos UserTransactionServiceImp。 有关完整的详细信息，请参阅[AtomikosProperties Javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/jta/atomikos/AtomikosProperties.html) 。

**Note**

为了确保多个事务管理器可以安全地协调相同的资源管理器，每个Atomikos实例必须配置一个唯一的ID。 默认情况下，这个ID是运行Atomikos的机器的IP地址。 为确保生产中的唯一性，您应该为应用程序的每个实例配置不同值的spring.jta.transaction-manager-id属性。

## 使用 Bitronix transaction manager

Bitronix是流行的开源JTA事务管理器实现。 您可以使用spring-boot-starter-jta-bitronix启动器将相应的Bitronix依赖项添加到您的项目中。 和Atomikos一样，Spring Boot会自动配置Bitronix，并对bean进行后处理，以确保启动和关闭顺序是正确的。

默认情况下，Bitronix事务日志文件（part1.btm和part2.btm）将写入应用程序主目录中的事务日志目录。 您可以使用spring.jta.log-dir属性来自定义此目录。 属性起始spring.jta.bitronix.properties也绑定到bitronix.tm.Configuration bean，允许完全自定义。 有关详细信息，请参阅[Bitronix documentation](https://github.com/bitronix/btm/wiki/Transaction-manager-configuration) 。

**Note**

为了确保多个事务管理器可以安全地协调相同的资源管理器，每个Bitronix实例必须配置一个唯一的ID。 默认情况下，这个ID是IP地址Bitronix正在运行的机器。 为确保生产中的唯一性，您应该为应用程序的每个实例配置不同值的spring.jta.transaction-manager-id属性。

## 使用 Narayana transaction manager

Narayana是JBoss支持的流行的开源JTA事务管理器实现。 您可以使用spring-boot-starter-jta-narayana启动器将相应的Narayana依赖项添加到您的项目中。 与Atomikos和Bitronix一样，Spring Boot会自动配置Narayana并后处理您的bean，以确保启动和关闭顺序是正确的。

默认情况下，Narayana事务日志将写入应用程序主目录（应用程序jar文件所在的目录）中的事务日志目录。 您可以通过在application.properties文件中设置spring.jta.log-dir属性来自定义此目录。 启动spring.jta.narayana.properties的属性也可以用来自定义Narayana配置。 有关完整的详细信息，请参阅[NarayanaProperties Javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/jta/narayana/NarayanaProperties.html) 。

**Note**

为确保多个事务管理器可以安全地协调相同的资源管理器，必须为每个Narayana实例配置一个唯一的ID。 默认情况下，这个ID设置为1.为了确保生产中的唯一性，您应该为应用程序的每个实例配置不同值的spring.jta.transaction-manager-id属性。

## 使用 Java EE managed transaction manager

如果您将Spring Boot应用程序打包为war或ear文件并将其部署到Java EE应用程序服务器，则可以使用应用程序服务器内置的事务管理器。 Spring Boot将尝试通过查看常见的JNDI位置（java：comp / UserTransaction，java：comp / TransactionManager等）来自动配置事务管理器。 如果您正在使用应用程序服务器提供的事务服务，则通常还需要确保所有资源都由服务器管理并通过JNDI公开。 Spring Boot将尝试通过在JNDI路径java：/ JmsXA或java：/ XAConnectionFactory中查找ConnectionFactory来自动配置JMS，并且可以使用[spring.datasource.jndi-name property](#_bookmark169)来配置您的DataSource。

## 混合 XA 和 non-XA JMS connections

当使用JTA时，主要的JMS ConnectionFactory bean将被XA感知并参与分布式事务。 在某些情况下，您可能需要使用非XA ConnectionFactory来处理某些JMS消息。 例如，您的JMS处理逻辑可能需要比XA超时更长的时间。

如果要使用非XA ConnectionFactory，则可以注入nonXaJmsConnectionFactory Bean，而不是@Primary jmsConnectionFactory Bean。 为了保持一致性，还使用bean别名xaJmsConnectionFactory提供了jmsConnectionFactory bean。

For example:

*// Inject the primary (XA aware) ConnectionFactory*

@Autowired

**private** ConnectionFactory defaultConnectionFactory;

*// Inject the XA aware ConnectionFactory (uses the alias and injects the same as above)*

@Autowired @Qualifier("xaJmsConnectionFactory")

**private** ConnectionFactory xaConnectionFactory;

*// Inject the non-XA aware ConnectionFactory* @Autowired @Qualifier("nonXaJmsConnectionFactory")

**private** ConnectionFactory nonXaConnectionFactory;

## 支持另一种嵌入式 transaction manager

[XAConnectionFactoryWrapper](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/jta/XAConnectionFactoryWrapper.java) 和 [XADataSourceWrapper](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/jta/XADataSourceWrapper.java) 接口可用于支持替代嵌入式事务管理器。 这些接口负责包装XAConnectionFactory和XADataSource bean，并将它们公开为常规的ConnectionFactory和DataSource bean，它们将透明地注册到分布式事务中。 只要您的ApplicationContext中注册了JtaTransactionManager bean和适当的XA包装Bean，DataSource和JMS自动配置将使用JTA变体。

[BitronixXAConnectionFactoryWrapper](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/jta/bitronix/BitronixXAConnectionFactoryWrapper.java) 和 [BitronixXADataSourceWrapper](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/jta/bitronix/BitronixXADataSourceWrapper.java) 提供了如何编写XA包装的很好的例子。

# Hazelcast

如果Hazelcast在类路径中，Spring Boot将自动配置一个可以在应用程序中注入的HazelcastInstance。 只有在找到配置的情况下才会创建HazelcastInstance。

你可以定义一个com.hazelcast.config.Config bean，我们将使用它。 如果您的配置定义了一个实例名称，我们将尝试找到一个现有的实例，而不是创建一个新的实例。

您还可以通过配置指定hazelcast.xml配置文件：

**spring.hazelcast.config**=classpath:config/my-hazelcast.xml

否则，Spring Boot将尝试从默认位置（即工作目录中的hazelcast.xml或类路径的根目录）中查找Hazelcast配置。 我们还检查是否设置了hazelcast.config系统属性。 查看[Hazelcast documentation](http://docs.hazelcast.org/docs/latest/manual/html-single/) 了解更多详情。

**Note**

Spring Boot也对[explicit caching support for Hazelcast](#_bookmark220)。 如果启用了缓存，则HazelcastInstance会自动包装在CacheManager实现中。

# Spring 集成(Integration)

Spring Boot为Spring Integration提供了一些便利，包括spring-boot-starter-integration“Starter”。 Spring Integration提供了对消息传递和其他传输（如HTTP，TCP等）的抽象。如果Spring Integration在类路径中可用，它将通过@EnableIntegration注释进行初始化。 如果'spring-integration-jmx'也在类路径上，消息处理统计将通过JMX发布。 有关更多详细信息，请参阅[IntegrationAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/integration/IntegrationAutoConfiguration.java) 类。

# Spring Session

Spring Boot为广泛的存储提供Spring Session自动配置：

* JDBC
* MongoDB
* Redis
* Hazelcast
* HashMap

如果Spring Session可用，则必须选择您希望用来存储会话的[StoreType](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/session/StoreType.java) 。 例如，要将JDBC用作后端存储，您可以按如下方式配置您的应用程序：

**spring.session.store-type**=jdbc

**Tip**

您可以通过将store-type设置为none来禁用Spring Session。

每个store都有特定的附加设置。 例如，可以为jdbc存储自定义表的名称：

**spring.session.jdbc.table-name**=SESSIONS

# 监控 和 管理 JMX

Java管理扩展（JMX）提供了一个标准机制来监视和管理应用程序。 默认情况下，Spring Boot将创建一个bean id为“mbeanServer”的MBeanServer，并公开所有使用Spring JMX注释（@ManagedResource，@ManagedAttribute，@ManagedOperation）注释的bean。

有关更多详细信息，请参阅[JmxAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jmx/JmxAutoConfiguration.java) 类。

# Testing

Spring Boot provides a number of utilities and annotations to help when testing your application. Test support is provided by two modules; spring-boot-test contains core items, and spring-boot- test-autoconfigure supports auto-configuration for tests.

Most developers will just use the spring-boot-starter-test ‘Starter’ which imports both Spring Boot test modules as well has JUnit, AssertJ, Hamcrest and a number of other useful libraries.

## Test scope dependencies

If you use the spring-boot-starter-test ‘Starter’ (in the test scope), you will find the following provided libraries:

* [JUnit](http://junit.org/) — The de-facto standard for unit testing Java applications.
* [Spring Test](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#integration-testing) & Spring Boot Test — Utilities and integration test support for Spring Boot applications.
* [AssertJ](http://joel-costigliola.github.io/assertj/) — A fluent assertion library.
* [Hamcrest](http://hamcrest.org/JavaHamcrest/) — A library of matcher objects (also known as constraints or predicates).
* [Mockito](http://mockito.org/) — A Java mocking framework.
* [JSONassert](https://github.com/skyscreamer/JSONassert) — An assertion library for JSON.
* [JsonPath](https://github.com/jayway/JsonPath) — XPath for JSON.

**Note**

By default, Spring Boot uses Mockito 1.x. However it’s also possible to use 2.x if you wish.

These are common libraries that we generally find useful when writing tests. You are free to add additional test dependencies of your own if these don’t suit your needs.

## Testing Spring applications

One of the major advantages of dependency injection is that it should make your code easier to unit test. You can simply instantiate objects using the new operator without even involving Spring. You can also use *mock objects* instead of real dependencies.

Often you need to move beyond ‘unit testing’ and start ‘integration testing’ (with a Spring ApplicationContext actually involved in the process). It’s useful to be able to perform integration testing without requiring deployment of your application or needing to connect to other infrastructure.

The Spring Framework includes a dedicated test module for just such integration testing. You can declare a dependency directly to org.springframework:spring-test or use the spring-boot- starter-test ‘Starter’ to pull it in transitively.

If you have not used the spring-test module before you should start by reading the [relevant section](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#testing) of the Spring Framework reference documentation.

## Testing Spring Boot applications

A Spring Boot application is just a Spring ApplicationContext, so nothing very special has to be done to test it beyond what you would normally do with a vanilla Spring context. One thing to watch out for though is that the external properties, logging and other features of Spring Boot are only installed in the context by default if you use SpringApplication to create it.

Spring Boot provides a @SpringBootTest annotation which can be used as an alternative to the standard spring-test @ContextConfiguration annotation when you need Spring Boot features. The annotation works by creating the ApplicationContext used in your tests via SpringApplication.

You can use the webEnvironment attribute of @SpringBootTest to further refine how your tests will run:

* MOCK — Loads a WebApplicationContext and provides a mock servlet environment. Embedded servlet containers are not started when using this annotation. If servlet APIs are not on your classpath this mode will transparently fallback to creating a regular non-web ApplicationContext. Can be used in conjunction with @AutoConfigureMockMvc for MockMvc-based testing of your application.
* RANDOM\_PORT — Loads an EmbeddedWebApplicationContext and provides a real servlet environment. Embedded servlet containers are started and listening on a random port.
* DEFINED\_PORT — Loads an EmbeddedWebApplicationContext and provides a real servlet environment. Embedded servlet containers are started and listening on a defined port (i.e from your application.properties or on the default port 8080).
* NONE — Loads an ApplicationContext using SpringApplication but does not provide *any*

servlet environment (mock or otherwise).

**Note**

If your test is @Transactional, it will rollback the transaction at the end of each test method by default. However, as using this arrangement with either RANDOM\_PORT or DEFINED\_PORT implicitly provides a real servlet environment, HTTP client and server will run in separate threads, thus separate transactions. Any transaction initiated on the server won’t rollback in this case.

**Note**

In addition to @SpringBootTest a number of other annotations are also provided for testing more specific slices of an application. See below for details.

**Tip**

Don’t forget to also add @RunWith(SpringRunner.class) to your test, otherwise the annotations will be ignored.

### Detecting test configuration

If you’re familiar with the Spring Test Framework, you may be used to using @ContextConfiguration(classes=…) in order to specify which Spring @Configuration to load. Alternatively, you might have often used nested @Configuration classes within your test.

When testing Spring Boot applications this is often not required. Spring Boot’s @\*Test annotations will search for your primary configuration automatically whenever you don’t explicitly define one.

The search algorithm works up from the package that contains the test until it finds a @SpringBootApplication or @SpringBootConfiguration annotated class. As long as you’ve [structured your code](#_bookmark50) in a sensible way your main configuration is usually found.

If you want to customize the primary configuration, you can use a nested @TestConfiguration class. Unlike a nested @Configuration class which would be used instead of a your application’s primary configuration, a nested @TestConfiguration class will be used in addition to your application’s primary configuration.

**Note**

Spring’s test framework will cache application contexts between tests. Therefore, as long as your tests share the same configuration (no matter how it’s discovered), the potentially time consuming process of loading the context will only happen once.

### Excluding test configuration

If your application uses component scanning, for example if you use @SpringBootApplication or @ComponentScan, you may find top-level configuration classes created only for specific tests accidentally get picked up everywhere.

As we [have seen above](#_bookmark262), @TestConfiguration can be used on an inner class of a test to customize the primary configuration. When placed on a top-level class, @TestConfiguration indicates that classes in src/test/java should not be picked up by scanning. You can then import that class explicitly where it is required:

@RunWith(SpringRunner.class) @SpringBootTest @Import(MyTestsConfiguration.class) **public class** MyTests {

@Test

**public void** exampleTest() {

...

}

}

**Note**

If you directly use @ComponentScan (i.e. not via @SpringBootApplication) you will need to register the TypeExcludeFilter with it. See [the Javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/context/TypeExcludeFilter.html) for details.

### Working with random ports

If you need to start a full running server for tests, we recommend that you use random ports. If you use @SpringBootTest(webEnvironment=WebEnvironment.RANDOM\_PORT) an available port will be picked at random each time your test runs.

The @LocalServerPort annotation can be used to [inject the actual port used](#_bookmark463) into your test. For convenience, tests that need to make REST calls to the started server can additionally @Autowire a TestRestTemplate which will resolve relative links to the running server.

**import** org.junit.Test;

**import** org.junit.runner.RunWith;

**import** org.springframework.beans.factory.annotation.Autowired;

**import** org.springframework.boot.test.context.SpringBootTest;

**import** org.springframework.boot.test.context.SpringBootTest.WebEnvironment;

**import** org.springframework.boot.test.web.client.TestRestTemplate;

**import** org.springframework.test.context.junit4.SpringRunner;

**import static** org.assertj.core.api.Assertions.assertThat; @RunWith(SpringRunner.class)

@SpringBootTest(webEnvironment = WebEnvironment.RANDOM\_PORT)

**public class** RandomPortExampleTests {

@Autowired

**private** TestRestTemplate restTemplate;

@Test

**public void** exampleTest() {

String body = **this**.restTemplate.getForObject(***"/"***, String.**class**); assertThat(body).isEqualTo(***"Hello World"***);

}

}

### Mocking and spying beans

It’s sometimes necessary to mock certain components within your application context when running tests. For example, you may have a facade over some remote service that’s unavailable during development. Mocking can also be useful when you want to simulate failures that might be hard to trigger in a real environment.

Spring Boot includes a @MockBean annotation that can be used to define a Mockito mock for a bean inside your ApplicationContext. You can use the annotation to add new beans, or replace a single existing bean definition. The annotation can be used directly on test classes, on fields within your test, or on @Configuration classes and fields. When used on a field, the instance of the created mock will also be injected. Mock beans are automatically reset after each test method.

**Note**

This feature is automatically enabled as long as your test uses one of Spring Boot’s test annotations (i.e. @SpringBootTest). To use this feature with a different arrangement, a listener will need to be added explicitly:

@TestExecutionListeners(MockitoTestExecutionListener.**class**)

Here’s a typical example where we replace an existing RemoteService bean with a mock implementation:

**import** org.junit.\*;

**import** org.junit.runner.\*;

**import** org.springframework.beans.factory.annotation.\*;

**import** org.springframework.boot.test.context.\*; **import** org.springframework.boot.test.mock.mockito.\*; **import** org.springframework.test.context.junit4.\*;

**import static** org.assertj.core.api.Assertions.\*;

**import static** org.mockito.BDDMockito.\*;

@RunWith(SpringRunner.class) @SpringBootTest

**public class** MyTests {

@MockBean

**private** RemoteService remoteService;

@Autowired

**private** Reverser reverser;

@Test

**public void** exampleTest() {

*// RemoteService has been injected into the reverser bean* given(**this**.remoteService.someCall()).willReturn(***"mock"***); String reverse = reverser.reverseSomeCall(); assertThat(reverse).isEqualTo(***"kcom"***);

}

}

Additionally you can also use @SpyBean to wrap any existing bean with a Mockito spy. See the Javadoc for full details.

### Auto-configured tests

Spring Boot’s auto-configuration system works well for applications, but can sometimes be a little too much for tests. It’s often helpful to load only the parts of the configuration that are required to test a ‘slice’ of your application. For example, you might want to test that Spring MVC controllers are mapping URLs correctly, and you don’t want to involve database calls in those tests; or you *might be wanting* to test JPA entities, and you’re not interested in web layer when those tests run.

The spring-boot-test-autoconfigure module includes a number of annotations that can be used to automatically configure such ‘slices’. Each of them works in a similar way, providing a @…Test annotation that loads the ApplicationContext and one or more @AutoConfigure… annotations that can be used to customize auto-configuration settings.

**Note**

Each slice loads a very restricted set of auto-configuration classes. If you need to exclude one of them, most @…Test annotations provide an excludeAutoConfiguration attribute. Alternatively, you can use @ImportAutoConfiguration#exclude.

**Tip**

It’s also possible to use the @AutoConfigure… annotations with the standard @SpringBootTest annotation. You can use this combination if you’re not interested in ‘slicing’ your application but you want some of the auto-configured test beans.

### Auto-configured JSON tests

To test that Object JSON serialization and deserialization is working as expected you can use the @JsonTest annotation. @JsonTest will auto-configure Jackson ObjectMapper, any @JsonComponent beans and any Jackson Modules. It also configures Gson if you happen to be using that instead of, or as well as, Jackson. If you need to configure elements of the auto-configuration you can use the @AutoConfigureJsonTesters annotation.

Spring Boot includes AssertJ based helpers that work with the JSONassert and JsonPath libraries to check that JSON is as expected. The JacksonTester, GsonTester and BasicJsonTester classes

can be used for Jackson, Gson and Strings respectively. Any helper fields on the test class can be

@Autowired when using @JsonTest.

**import** org.junit.\*;

**import** org.junit.runner.\*;

**import** org.springframework.beans.factory.annotation.\*; **import** org.springframework.boot.test.autoconfigure.json.\*; **import** org.springframework.boot.test.context.\*;

**import** org.springframework.boot.test.json.\*;

**import** org.springframework.test.context.junit4.\*;

**import static** org.assertj.core.api.Assertions.\*; @RunWith(SpringRunner.class)

@JsonTest

**public class** MyJsonTests {

@Autowired

**private** JacksonTester<VehicleDetails> json;

@Test

**public void** testSerialize() **throws** Exception {

VehicleDetails details = **new** VehicleDetails(***"Honda"***, ***"Civic"***);

*// Assert against a `.json` file in the same package as the test*

assertThat(**this**.json.write(details)).isEqualToJson(***"expected.json"***);

*// Or use JSON path based assertions* assertThat(**this**.json.write(details)).hasJsonPathStringValue(***"@.make"***); assertThat(**this**.json.write(details)).extractingJsonPathStringValue(***"@.make"***)

.isEqualTo(***"Honda"***);

}

@Test

**public void** testDeserialize() **throws** Exception {

String content = ***"{\"make\":\"Ford\",\"model\":\"Focus\"}"***; assertThat(**this**.json.parse(content))

.isEqualTo(**new** VehicleDetails(***"Ford"***, ***"Focus"***)); assertThat(**this**.json.parseObject(content).getMake()).isEqualTo(***"Ford"***);

}

}

**Note**

JSON helper classes can also be used directly in standard unit tests. Simply call the initFields

method of the helper in your @Before method if you aren’t using @JsonTest.

A list of the auto-configuration that is enabled by @JsonTest can be [found in the appendix](#_bookmark592).

### Auto-configured Spring MVC tests

To test Spring MVC controllers are working as expected you can use the @WebMvcTest annotation. @WebMvcTest will auto-configure the Spring MVC infrastructure and limit scanned beans to @Controller, @ControllerAdvice, @JsonComponent, Filter, WebMvcConfigurer and HandlerMethodArgumentResolver. Regular @Component beans will not be scanned when using this annotation.

Often @WebMvcTest will be limited to a single controller and used in combination with @MockBean to provide mock implementations for required collaborators.

@WebMvcTest also auto-configures MockMvc. Mock MVC offers a powerful way to quickly test MVC controllers without needing to start a full HTTP server.

**Tip**

You can also auto-configure MockMvc in a non-@WebMvcTest (e.g. SpringBootTest) by annotating it with @AutoConfigureMockMvc.

**import** org.junit.\*;

**import** org.junit.runner.\*;

**import** org.springframework.beans.factory.annotation.\*;

**import** org.springframework.boot.test.autoconfigure.web.servlet.\*;

**import** org.springframework.boot.test.mock.mockito.\*;

**import static** org.assertj.core.api.Assertions.\*;

**import static** org.mockito.BDDMockito.\*;

**import static** org.springframework.test.web.servlet.request.MockMvcRequestBuilders.\*;

**import static** org.springframework.test.web.servlet.result.MockMvcResultMatchers.\*;

@RunWith(SpringRunner.class) @WebMvcTest(UserVehicleController.class) **public class** MyControllerTests {

@Autowired

**private** MockMvc mvc;

@MockBean

**private** UserVehicleService userVehicleService;

@Test

**public void** testExample() **throws** Exception { given(**this**.userVehicleService.getVehicleDetails(***"sboot"***))

.willReturn(**new** VehicleDetails(***"Honda"***, ***"Civic"***));

**this**.mvc.perform(get(***"/sboot/vehicle"***).accept(MediaType.TEXT\_PLAIN))

.andExpect(status().isOk()).andExpect(content().string(***"Honda Civic"***));

}

}

**Tip**

If you need to configure elements of the auto-configuration (for example when servlet filters should be applied) you can use attributes in the @AutoConfigureMockMvc annotation.

If you use HtmlUnit or Selenium, auto-configuration will also provide a WebClient bean and/or a

WebDriver bean. Here is an example that uses HtmlUnit:

**import** com.gargoylesoftware.htmlunit.\*;

**import** org.junit.\*;

**import** org.junit.runner.\*;

**import** org.springframework.beans.factory.annotation.\*;

**import** org.springframework.boot.test.autoconfigure.web.servlet.\*;

**import** org.springframework.boot.test.mock.mockito.\*;

**import static** org.assertj.core.api.Assertions.\*;

**import static** org.mockito.BDDMockito.\*;

@RunWith(SpringRunner.class) @WebMvcTest(UserVehicleController.class) **public class** MyHtmlUnitTests {

@Autowired

**private** WebClient webClient;

@MockBean

**private** UserVehicleService userVehicleService;

@Test

**public void** testExample() **throws** Exception { given(**this**.userVehicleService.getVehicleDetails(***"sboot"***))

.willReturn(**new** VehicleDetails(***"Honda"***, ***"Civic"***)); HtmlPage page = **this**.webClient.getPage(***"/sboot/vehicle.html"***);

assertThat(page.getBody().getTextContent()).isEqualTo(***"Honda Civic"***);

}

}

**Note**

By default Spring Boot will put WebDriver beans in a special “scope” to ensure that the driver is quit after each test, and that a new instance is injected. If you don’t want this behavior you can add @Scope("singleton") to your WebDriver @Bean definition.

A list of the auto-configuration that is enabled by @WebMvcTest can be [found in the appendix](#_bookmark592).

### Auto-configured Data JPA tests

@DataJpaTest can be used if you want to test JPA applications. By default it will configure an in- memory embedded database, scan for @Entity classes and configure Spring Data JPA repositories. Regular @Component beans will not be loaded into the ApplicationContext.

Data JPA tests are transactional and rollback at the end of each test by default, see the [relevant section](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle#testcontext-tx-enabling-transactions) in the Spring Reference Documentation for more details. If that’s not what you want, you can disable transaction management for a test or for the whole class as follows:

**import** org.junit.Test;

**import** org.junit.runner.RunWith;

**import** org.springframework.boot.test.autoconfigure.orm.jpa.DataJpaTest;

**import** org.springframework.test.context.junit4.SpringRunner; **import** org.springframework.transaction.annotation.Propagation; **import** org.springframework.transaction.annotation.Transactional;

@RunWith(SpringRunner.class) @DataJpaTest

@Transactional(propagation = Propagation.NOT\_SUPPORTED)

**public class** ExampleNonTransactionalTests {

}

Data JPA tests may also inject a [TestEntityManager](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-test-autoconfigure/src/main/java/org/springframework/boot/test/autoconfigure/orm/jpa/TestEntityManager.java) bean which provides an alternative to the standard JPA EntityManager specifically designed for tests. If you want to use TestEntityManager outside of @DataJpaTests you can also use the @AutoConfigureTestEntityManager annotation. A JdbcTemplate is also available if you need that.

**import** org.junit.\*;

**import** org.junit.runner.\*;

**import** org.springframework.boot.test.autoconfigure.orm.jpa.\*;

**import static** org.assertj.core.api.Assertions.\*; @RunWith(SpringRunner.class)

@DataJpaTest

**public class** ExampleRepositoryTests {

@Autowired

**private** TestEntityManager entityManager;

@Autowired

**private** UserRepository repository;

@Test

**public void** testExample() **throws** Exception { **this**.entityManager.persist(**new** User(***"sboot"***, ***"1234"***)); User user = **this**.repository.findByUsername(***"sboot"***); assertThat(user.getUsername()).isEqualTo(***"sboot"***); assertThat(user.getVin()).isEqualTo(***"1234"***);

}

}

In-memory embedded databases generally work well for tests since they are fast and don’t require any developer installation. If, however, you prefer to run tests against a real database you can use the @AutoConfigureTestDatabase annotation:

@RunWith(SpringRunner.class) @DataJpaTest

@AutoConfigureTestDatabase(replace=Replace.NONE)

**public class** ExampleRepositoryTests {

*// ...*

}

A list of the auto-configuration that is enabled by @DataJpaTest can be [found in the appendix](#_bookmark592).

### Auto-configured JDBC tests

@JdbcTest is similar to @DataJpaTest but for pure jdbc-related tests. By default it will also configure an in-memory embedded database and a JdbcTemplate. Regular @Component beans will not be loaded into the ApplicationContext.

JDBC tests are transactional and rollback at the end of each test by default, see the [relevant section](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle#testcontext-tx-enabling-transactions) in the Spring Reference Documentation for more details. If that’s not what you want, you can disable transaction management for a test or for the whole class as follows:

**import** org.junit.Test;

**import** org.junit.runner.RunWith;

**import** org.springframework.boot.test.autoconfigure.jdbc.JdbcTest; **import** org.springframework.test.context.junit4.SpringRunner; **import** org.springframework.transaction.annotation.Propagation; **import** org.springframework.transaction.annotation.Transactional;

@RunWith(SpringRunner.class) @JdbcTest

@Transactional(propagation = Propagation.NOT\_SUPPORTED)

**public class** ExampleNonTransactionalTests {

}

If you prefer your test to run against a real database, you can use the @AutoConfigureTestDatabase

annotation the same way as for DataJpaTest.

A list of the auto-configuration that is enabled by @JdbcTest can be [found in the appendix](#_bookmark592).

### Auto-configured Data MongoDB tests

@DataMongoTest can be used if you want to test MongoDB applications. By default, it will configure an in-memory embedded MongoDB (if available), configure a MongoTemplate, scan for @Document classes and configure Spring Data MongoDB repositories. Regular @Component beans will not be loaded into the ApplicationContext:

**import** org.junit.runner.RunWith;

**import** org.springframework.beans.factory.annotation.Autowired;

**import** org.springframework.boot.test.autoconfigure.data.mongo.DataMongoTest;

**import** org.springframework.data.mongodb.core.MongoTemplate;

**import** org.springframework.test.context.junit4.SpringRunner;

@RunWith(SpringRunner.class) @DataMongoTest

**public class** ExampleDataMongoTests {

@Autowired

**private** MongoTemplate mongoTemplate;

*//*

}

In-memory embedded MongoDB generally works well for tests since it is fast and doesn’t require any developer installation. If, however, you prefer to run tests against a real MongoDB server you should exclude the embedded MongoDB auto-configuration:

**import** org.junit.runner.RunWith;

**import** org.springframework.boot.autoconfigure.mongo.embedded.EmbeddedMongoAutoConfiguration;

**import** org.springframework.boot.test.autoconfigure.data.mongo.DataMongoTest;

**import** org.springframework.test.context.junit4.SpringRunner;

@RunWith(SpringRunner.class)

@DataMongoTest(excludeAutoConfiguration = EmbeddedMongoAutoConfiguration.class)

**public class** ExampleDataMongoNonEmbeddedTests {

}

A list of the auto-configuration that is enabled by @DataMongoTest can be [found in the appendix](#_bookmark592).

### Auto-configured REST clients

The @RestClientTest annotation can be used if you want to test REST clients. By default it will auto-configure Jackson and GSON support, configure a RestTemplateBuilder and add support for MockRestServiceServer. The specific beans that you want to test should be specified using value or components attribute of @RestClientTest:

@RunWith(SpringRunner.class) @RestClientTest(RemoteVehicleDetailsService.class) **public class** ExampleRestClientTest {

@Autowired

**private** RemoteVehicleDetailsService service;

@Autowired

**private** MockRestServiceServer server;

@Test

**public void** getVehicleDetailsWhenResultIsSuccessShouldReturnDetails()

**throws** Exception {

**this**.server.expect(requestTo(***"/greet/details"***))

.andRespond(withSuccess(***"hello"***, MediaType.TEXT\_PLAIN)); String greeting = **this**.service.callRestService(); assertThat(greeting).isEqualTo(***"hello"***);

}

}

A list of the auto-configuration that is enabled by @RestClientTest can be [found in the appendix](#_bookmark592).

### Auto-configured Spring REST Docs tests

The @AutoConfigureRestDocs annotation can be used if you want to use Spring REST Docs in your tests. It will automatically configure MockMvc to use Spring REST Docs and remove the need for Spring REST Docs' JUnit rule.

**import** org.junit.Test;

**import** org.junit.runner.RunWith;

**import** org.springframework.beans.factory.annotation.Autowired;

**import** org.springframework.boot.test.autoconfigure.web.servlet.WebMvcTest;

**import** org.springframework.http.MediaType;

**import** org.springframework.test.context.junit4.SpringRunner;

**import** org.springframework.test.web.servlet.MockMvc;

**import static** org.springframework.restdocs.mockmvc.MockMvcRestDocumentation.document; **import static** org.springframework.test.web.servlet.request.MockMvcRequestBuilders.get; **import static** org.springframework.test.web.servlet.result.MockMvcResultMatchers.\*;

@RunWith(SpringRunner.class) @WebMvcTest(UserController.class) @AutoConfigureRestDocs("target/generated-snippets") **public class** UserDocumentationTests {

@Autowired

**private** MockMvc mvc;

@Test

**public void** listUsers() **throws** Exception {

**this**.mvc.perform(get(***"/users"***).accept(MediaType.TEXT\_PLAIN))

.andExpect(status().isOk())

.andDo(document(***"list-users"***));

}

}

In addition to configuring the output directory, @AutoConfigureRestDocs can also configure the host, scheme, and port that will appear in any documented URIs. If you require more control over Spring REST Docs' configuration a RestDocsMockMvcConfigurationCustomizer bean can be used:

@TestConfiguration

**static class** CustomizationConfiguration

**implements** RestDocsMockMvcConfigurationCustomizer {

@Override

**public void** customize(MockMvcRestDocumentationConfigurer configurer) { configurer.snippets().withTemplateFormat(TemplateFormats.markdown());

}

}

If you want to make use of Spring REST Docs' support for a parameterized output directory, you can create a RestDocumentationResultHandler bean. The auto-configuration will call alwaysDo with this result handler, thereby causing each MockMvc call to automatically generate the default snippets:

@TestConfiguration

**static class** ResultHandlerConfiguration {

@Bean

**public** RestDocumentationResultHandler restDocumentation() {

**return** MockMvcRestDocumentation.document(***"{method-name}"***);

}

}

### Using Spock to test Spring Boot applications

If you wish to use Spock to test a Spring Boot application you should add a dependency on Spock’s spock-spring module to your application’s build. spock-spring integrates Spring’s test framework into Spock. Exactly how you can use Spock to test a Spring Boot application depends on the version of Spock that you are using.

**Note**

Spring Boot provides dependency management for Spock 1.0. If you wish to use Spock 1.1 you should [override the spock.version property](#_bookmark550) in your build.gradle or pom.xml file.

When using Spock 1.1, the annotations [described above](#_bookmark261) can only be used and you can annotate your

Specification with @SpringBootTest to suit the needs of your tests.

When using Spock 1.0, @SpringBootTest will not work for a web project. You need to use @SpringApplicationConfiguration and @WebIntegrationTest(randomPort = true). Being unable to use @SpringBootTest means that you also lose the auto-configured TestRestTemplate bean. You can create an equivalent bean yourself using the following configuration:

@Configuration

**static class** TestRestTemplateConfiguration {

@Bean

**public** TestRestTemplate testRestTemplate( ObjectProvider<RestTemplateBuilder> builderProvider, Environment environment) {

RestTemplateBuilder builder = builderProvider.getIfAvailable(); TestRestTemplate template = builder == null ? **new** TestRestTemplate()

: **new** TestRestTemplate(builder.build()); template.setUriTemplateHandler(**new** LocalHostUriTemplateHandler(environment)); **return** template;

}

}

## Test utilities

A few test utility classes are packaged as part of spring-boot that are generally useful when testing your application.

### ConfigFileApplicationContextInitializer

ConfigFileApplicationContextInitializer is an ApplicationContextInitializer that can apply to your tests to load Spring Boot application.properties files. You can use this when you don’t need the full features provided by @SpringBootTest.

@ContextConfiguration(classes = Config.**class**,

initializers = ConfigFileApplicationContextInitializer.**class**)

**Note**

Using ConfigFileApplicationContextInitializer alone won’t provide support for @Value("${…}") injection. Its only job is to ensure that application.properties files are loaded into Spring’s Environment. For @Value support you need to either additionally configure

a PropertySourcesPlaceholderConfigurer or use @SpringBootTest where one will be auto-configured for you.

### EnvironmentTestUtils

EnvironmentTestUtils allows you to quickly add properties to a ConfigurableEnvironment or

ConfigurableApplicationContext. Simply call it with key=value strings:

EnvironmentTestUtils.addEnvironment(env, ***"org=Spring"***, ***"name=Boot"***);

### OutputCapture

OutputCapture is a JUnit Rule that you can use to capture System.out and System.err output. Simply declare the capture as a @Rule then use toString() for assertions:

**import** org.junit.Rule;

**import** org.junit.Test;

**import** org.springframework.boot.test.rule.OutputCapture;

**import static** org.hamcrest.Matchers.\*;

**import static** org.junit.Assert.\*;

**public class** MyTest { @Rule

**public** OutputCapture capture = **new** OutputCapture();

@Test

**public void** testName() **throws** Exception { System.out.println(***"Hello World!"***); assertThat(capture.toString(), containsString(***"World"***));

}

}

### TestRestTemplate

TestRestTemplate is a convenience alternative to Spring’s RestTemplate that is useful in integration tests. You can get a vanilla template or one that sends Basic HTTP authentication (with a username and password). In either case the template will behave in a test-friendly way by not throwing exceptions on server-side errors. It is recommended, but not mandatory, to use Apache HTTP Client (version 4.3.2 or better), and if you have that on your classpath the TestRestTemplate will respond by configuring the client appropriately. If you do use Apache’s HTTP client some additional test-friendly features will be enabled:

* Redirects will not be followed (so you can assert the response location)
* Cookies will be ignored (so the template is stateless)

TestRestTemplate can be instantiated directly in your integration tests:

**public class** MyTest {

**private** TestRestTemplate template = **new** TestRestTemplate(); @Test

**public void** testRequest() **throws** Exception {

HttpHeaders headers = template.getForEntity([***"http://myhost.com/example"***](http://myhost.com/example), String.**class**).getHeaders();

assertThat(headers.getLocation().toString(), containsString(***"myotherhost"***));

}

}

Alternatively, if you are using the @SpringBootTest annotation with WebEnvironment.RANDOM\_PORT or WebEnvironment.DEFINED\_PORT, you can just inject a fully configured TestRestTemplate and start using it. If necessary, additional customizations can be applied via the RestTemplateBuilder bean. Any URLs that do not specify a host and port will automatically connect to the embedded server:

@RunWith(SpringRunner.class) @SpringBootTest

**public class** MyTest {

@Autowired

**private** TestRestTemplate template;

@Test

**public void** testRequest() **throws** Exception {

HttpHeaders headers = template.getForEntity(***"/example"***, String.**class**).getHeaders(); assertThat(headers.getLocation().toString(), containsString(***"myotherhost"***));

}

@TestConfiguration

**static class** Config {

@Bean

**public** RestTemplateBuilder restTemplateBuilder() {

**return new** RestTemplateBuilder()

.additionalMessageConverters(...)

.customizers(...);

}

}

}

# WebSockets

Spring Boot为嵌入式Tomcat（8和7），Jetty 9和Undertow提供WebSockets自动配置。 如果您将war文件部署到独立容器，Spring Boot会假定该容器将负责配置其WebSocket支持。

Spring Framework提供了丰富的WebSocket支持[rich WebSocket support](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#websocket) ，可以通过spring-boot-starter-websocket模块轻松访问。

# Web Services

Spring Boot提供Web服务自动配置，以便所有需要定义您的端点。

Spring Web Services功能([Spring Web Services features](http://docs.spring.io/spring-ws/docs/2.4.0.RELEASE/reference/htmlsingle))可以通过

spring-boot-starter-webservices模块轻松访问。

# 创建自己的 auto-configuration

如果您在开发共享库的公司工作，或者如果您在开源或商业库上工作，则可能需要开发自己的自动配置。 自动配置类可以捆绑在外部的jars里，并且仍然可以被Spring Boot找到。

自动配置可以与提供自动配(auto-configuration)）代码的“启动器”以及您将使用的典型库相关联。 我们将首先介绍您需要知道的构建自己的自动配置，然后我们将继续执行创建自定义启动器所需的典型步骤([typical steps required to create a custom starter](#_bookmark292))。

**Tip**

[demo project](https://github.com/snicoll-demos/spring-boot-master-auto-configuration) 可用于展示如何逐步创建启动器。

## 了解 auto-configured beans

在引擎盖下，自动配置是通过标准的@Configuration类来实现的。 额外的@Conditional注解用于约束何时应用自动配置。 通常，自动配置类使用@ConditionalOnClass和@ConditionalOnMissingBean注释。 这确保只有在找到相关的类并且没有声明自己的@Configuration时，自动配置才会适用。

您可以浏览f [spring-boot-autoconfigure](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure) 的源代码来查看@Configuration

我们提供的类（参见[META-INF/spring.factories](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/resources/META-INF/spring.factories) 文件）。

## 加载 auto-configuration (候选)candidates

Spring Boot检查发布的jar文件中是否存在META-INF / spring.factories文件。 该文件应在EnableAutoConfiguration密钥下列出您的配置类。

org.springframework.boot.autoconfigure.EnableAutoConfiguration=\ com.mycorp.libx.autoconfigure.LibXAutoConfiguration,\ com.mycorp.libx.autoconfigure.LibXWebAutoConfiguration

如果需要按特定顺序应用配置，则可以使用[@AutoConfigureAfter](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/AutoConfigureAfter.java) 或 [@AutoConfigureBefore](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/AutoConfigureBefore.java) 注释。 例如，如果您提供特定于Web的配置，则可能需要在WebMvcAutoConfiguration之后应用您的类。

如果您想要订购某些不应彼此直接了解的自动配置，则还可以使用@AutoconfigureOrder。 该注释具有与常规@Order注释相同的语义，但为自动配置类提供了专用的顺序。

**Note**

自动配置只能以这种方式加载。 确保它们在特定的包装空间中定义，并且它们绝对不是特别针对组件扫描的目标。

## 条件 annotations

您几乎总是希望在自动配置类中包含一个或多个@Conditional注释。 @ConditionalOnMissingBean是一个常用的例子，如果开发人员不满意你的默认值，开发人员可以“覆盖”自动配置。

Spring Boot包含许多@Conditional注释，您可以在自己的代码中重复使用批注@Configuration类或各个@Bean方法。

### Class 条件(conditions)

@ConditionalOnClass和@ConditionalOnMissingClass注释允许根据是否存在特定的类来包含配置。 由于使用[ASM](http://asm.ow2.org/) 解析注释元数据的事实，您实际上可以使用value属性来引用真实类，即使该类可能实际上并不出现在正在运行的应用程序类路径中。 如果您希望使用字符串值指定类名称，也可以使用name属性。

**Tip**

如果您使用@ConditionalOnClass或@ConditionalOnMissingClass作为元注释的一部分来组成自己的注释，那么您必须使用名称作为引用类，在这种情况下不处理。

### Bean 条件(conditions)

@ConditionalOnBean和@ConditionalOnMissingBean注释允许基于特定bean的存在或不存在来包含bean。 您可以使用value属性来按类型指定bean，或者使用name来指定bean的名称。 搜索属性允许您限制搜索bean时应考虑的ApplicationContext层次结构。

放置在@Bean方法上时，目标类型默认为方法的返回类型，例如：

@Configuration

**public class** MyAutoConfiguration {

@Bean @ConditionalOnMissingBean

**public** MyService myService() { ... }

}

在上面的例子中，如果在ApplicationContext中没有包含MyService类型的bean，myService bean将被创建。

**Tip**

您需要非常小心添加bean定义的顺序，因为这些条件是基于到目前为止处理的内容进行评估的。 出于这个原因，我们建议在自动配置类上只使用@ConditionalOnBean和@ConditionalOnMissingBean注释（因为在添加任何用户定义的bean定义之后，这些注释会被保证加载）。

**Note**

@ConditionalOnBean和@ConditionalOnMissingBean不会阻止创建@Configuration类。 在类级使用这些条件相当于用注释标记每个包含的@Bean方法。

### 属性条件(Property conditions)

@ConditionalOnProperty注解允许基于Spring环境属性包含配置。 使用前缀和名称属性来指定应该检查的属性。 默认情况下，任何存在且不等于false的属性都将被匹配。 您还可以使用havingValue和matchIfMissing属性创建更高级的检查。

### 资源条件(Resource conditions)

@ConditionalOnResource批注允许配置仅在特定资源存在时才包含。 可以使用常规的Spring约定来指定资源，例如file：/home/user/test.dat。

### Web application conditions

@ConditionalOnWebApplication和@ConditionalOnNotWebApplication批注允许包含配置，具体取决于应用程序是否是“Web应用程序”。 Web应用程序是使用Spring WebApplicationContext的任何应用程序，定义会话范围(scope)或具有StandardServletEnvironment。

### SpEL expression conditions

@ConditionalOnExpression批注允许根据[SpEL expression](http://docs.spring.io/spring/docs/4.3.12.RELEASE/spring-framework-reference/htmlsingle/#expressions)的结果包含配置。

## 创建自己的 starter

一个完整的Spring Boot启动器可能包含以下组件：

* 包含自动配置代码的自动配置模块。
* 启动器模块提供对自动配置模块的依赖关系，以及库和任何通常有用的附加依赖项。 简而言之，添加启动器应该足以开始使用该库。

**Tip**

如果您不需要将这两个问题分开，您可以将自动配置代码和依赖管理结合在一个模块中。

### Naming

请确保为您的初学者提供适当的名称空间(namespace)。 即使使用不同的Maven组标识，也不要使用spring-boot启动模块名称。 我们可能会为您将来自动配置的东西提供官方支持。

这是一个经验法则。 假设您正在为“acme”创建一个启动器(starter)，命名自动配置模块acme-spring-boot-autoconfigure和启动器acme-spring-boot-starter。 如果只有一个模块组合这两个模块，请使用acme-spring-boot-starter。

此外，如果您的初学者提供配置密钥(configuration keys)，请为其使用适当的名称空间。 特别是，不要把你的密钥包含在Spring Boot使用的命名空间中（例如server, management, spring等）。 这些都是“ours”，我们可能会在未来改善/修改它们，这样可能会破坏你的东西。

确保[trigger meta-data generation](#_bookmark586)，以便您的密钥(keys)也可以使用IDE帮助。 您可能需要查看生成的元数据（META-INF / spring-configuration-metadata.json），以确保您的密钥(keys)被正确记录。

### 自动配置模块 (Autoconfigure module)

自动配置模块包含开始使用库所需的一切。 它还可能包含配置键(keys)定义（@ConfigurationProperties）和任何回调接口，可用于进一步定制组件的初始化方式。

**Tip**

您应该将库的依赖项标记为可选，以便您可以更轻松地将自动配置模块包含在项目中。 如果你这样做，库将不会被提供，Spring Boot默认会退出。

### Starter module

首先是一个空jar，真的。 它唯一的目的是提供必要的依赖来与library合作。 把它看作是对开始所需要的东西的一种自以为是的观点。

不要对添加起动器的项目做出假设。 如果您自动配置的库通常需要其他启动程序，请提及它们。 如果可选依赖项的数量很高，那么提供一组适当的默认依赖关系可能会很困难，因为您应该避免为库的典型用法带来不必要的依赖关系。

# What to read next

如果您想了解更多关于本节讨论的任何类的信息，可以查看[Spring](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api) [Boot API documentation](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api) ，也可以直接浏览[source code directly](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE)。 如果您有具体问题，请参阅操作指南部分[how-to](#_bookmark438) 。

如果您对Spring Boot的核心功能感到满意，可以继续阅读有关生产就绪功能[production-](#_bookmark297) [ready features](#_bookmark297)。

**Part V. Spring Boot Actuator: Production-ready features**

Spring Boot包含许多附加功能，可帮助您在应用程序投入生产时监视和管理应用程序。 您可以选择使用HTTP端点，JMX甚至远程shell（SSH或Telnet）来管理和监视您的应用程序。 审计，健康和指标收集可以自动应用于您的应用程序。

执行器HTTP端点仅适用于基于Spring MVC的应用程序。 尤其是，除非启用Spring MVC，否则它将不能与Jersey一起工作[unless you enable Spring MVC as well.](#_bookmark532)。

# 启用 production-ready features

[spring-boot-actuator](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator) 模块提供了Spring Boot的所有生产就绪功能。 启用这些功能的最简单方法是在spring-boot-starter-actuator ‘Starter’上添加一个依赖项。

|  |
| --- |
| **Definition of Actuator**  致动器(actuator)是制造术语，指的是用于移动或控制某物的机械装置。 执行器可以从一个小的变化中产生大量的运动。 |

要将执行器添加到基于Maven的项目中，请添加以下“Starter”依赖项：

**<dependencies>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-actuator**</artifactId>**

**</dependency>**

**</dependencies>**

对于, 使用一下声明:

dependencies {

compile(***"org.springframework.boot:spring-boot-starter-actuator"***)

}

# Endpoints(端点)

执行器端点(Actuator endpoints)允许您监视和与您的应用程序进行交互。 Spring Boot包含许多内置的端点，您也可以添加自己的端点。 例如，健康端点提供基本的应用程序健康信息。

端点的暴露方式取决于您选择的技术类型。 大多数应用程序选择HTTP监视，其中端点的ID映射到一个URL。 例如，默认情况下，运行状况端点将映射到/ health。

以下技术不可知的端点可用：

|  |  |  |
| --- | --- | --- |
| **ID** | **Description** | **Sensitive Default** |
| actuator  auditevents | Provides a hypermedia-based “discovery page” for the other endpoints. Requires Spring HATEOAS to be on the classpath.  Exposes audit events information for the current application. | true  true |
| autoconfig | Displays an auto-configuration report showing all auto- configuration candidates and the reason why they ‘were’ or ‘were not’ applied. | true |
| beans | Displays a complete list of all the Spring beans in your application. | true |
| configprops | Displays a collated list of all @ConfigurationProperties. | true |
| dump env | Performs a thread dump.  Exposes properties from Spring’s  ConfigurableEnvironment. | true true |
| flyway | Shows any Flyway database migrations that have been applied. | true |
| health | Shows application health information (when the application is secure, a simple ‘status’ when accessed over an unauthenticated connection or full message details when authenticated). | false |
| info loggers | Displays arbitrary application info.  Shows and modifies the configuration of loggers in the application. | false true |
| liquibase | Shows any Liquibase database migrations that have been applied. | true |
| metrics | Shows ‘metrics’ information for the current application. | true |
| mappings | Displays a collated list of all @RequestMapping paths. | true |

|  |  |  |
| --- | --- | --- |
| **ID** | **Description** | **Sensitive Default** |
| shutdown | Allows the application to be gracefully shutdown (not enabled | true |
|  | by default). |  |
| trace | Displays trace information (by default the last 100 HTTP | true |
|  | requests). |  |

如果您使用Spring MVC，还可以使用以下附加端点：

|  |  |  |
| --- | --- | --- |
| **ID**  docs | **Description**  Displays documentation, including example requests and responses, for the Actuator’s endpoints. Requires spring- boot-actuator-docs to be on the classpath. | **Sensitive Default**  false |
| heapdump | Returns a GZip compressed hprof heap dump file. | true |
| jolokia | Exposes JMX beans over HTTP (when Jolokia is on the classpath). | true |
| logfile | Returns the contents of the logfile (if logging.file or logging.path properties have been set). Supports the use of the HTTP Range header to retrieve part of the log file’s content. | true |

**Note**

根据端点的暴露方式，敏感属性(sensitive property)可以用作安全提示。 例如，sensitive property在通过HTTP访问时将需要用户名/密码（或者如果未启用Web安全性，则只需将其禁用）。

## 自定义 endpoints

端点可以使用Spring属性进行自定义。 您可以更改端点是否已启用，是否敏感，甚至是否为其ID。

例如，这里是一个application.properties，它改变了bean的敏感度和id

端点，并启用关机。

**endpoints.beans.id**=springbeans **endpoints.beans.sensitive**=false **endpoints.shutdown.enabled**=true

**Note**

前缀#endpoints +. +name“用于唯一标识正在配置的端点。

默认情况下，除关闭以外的所有端点均已启用。 如果您希望专门“opt-in”端点启用，则可以使用endpoints.enabled属性。 例如，以下将禁用除info以外的所有端点：

**endpoints.enabled**=false **endpoints.info.enabled**=true

同样，您也可以选择全局设置所有端点的“sensitive”标志。 默认情况下，敏感标志取决于端点的类型（请参阅上表）。 例如，要将所有端点标记为除info之外的其他端点：

**endpoints.sensitive**=true **endpoints.info.sensitive**=false

## Hypermedia for actuator MVC endpoints

如果endpoints.hypermedia.enabled设置为true，并且[Spring HATEOAS](http://projects.spring.io/spring-hateoas) 位于类路径中（例如，通过spring-boot-starter-hateoas或者使用[Spring Data REST](http://projects.spring.io/spring-data-rest)），那么来自Actuator的HTTP端点将通过超媒体链接进行增强， 并添加一个“discovery page”链接到所有的端点。 默认情况下，“discovery page”在/执行器上可用。 它被实现为一个端点，允许使用属性来配置它的路径（endpoints.actuator.path），以及是否启用（endpoints.actuator.enabled）。

当定制管理上下文路径被配置时，“discovery page”将自动从/执行器移动到管理上下文的根。 例如，如果管理上下文路径是/ management，则发现页面将从/ management可用。

如果[HAL Browser](https://github.com/mikekelly/hal-browser)通过其webjar（org.webjars：hal-browser）或通过spring-data-rest-hal-browser在类路径上，那么以HAL浏览器形式的HTML“discovery page” 还提供了。

## 跨域支持(CORS support)

跨源资源共享（[Cross-origin resource sharing](http://en.wikipedia.org/wiki/Cross-origin_resource_sharing) CORS）是[W3C specification](http://www.w3.org/TR/cors/) 规范，允许您以灵活的方式指定哪种跨域请求被授权。 执行器的MVC端点可以配置为支持这种情况。

CORS支持在默认情况下是禁用的，只有在设置了endpoints.cors.allowed- origins属性后才能启用。 下面的配置允许来自example.com域的GET和POST调用：

**endpoints.cors.allowed-origins**[=http://example.com](http://example.com/) **endpoints.cors.allowed-methods**=GET,POST

**Tip**

检查[EndpointCorsProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/EndpointCorsProperties.java) 以获取完整的选项列表。

## 添加自定义 endpoints

如果添加了Endpoint类型的@Bean，那么它将自动通过JMX和HTTP（如果有可用的服务器）公开。 可以通过创建MvcEndpoint类型的bean来进一步定制HTTP端点。 您的MvcEndpoint不是@Controller，但可以使用@RequestMapping（和@ Managed \*）来公开资源。

**Tip**

如果你正在做一个库特性，可以考虑在@ org.springframework.boot.actuate.autoconfigure.ManagementContextConfiguration项下添加一个用@ManagementContextConfiguration注解的配置类到/META-INF/spring.factories。

如果你这样做，那么如果你的用户要求一个单独的管理端口或地址，端点将会移动到所有其他MVC端点的子上下文中。 如果要将静态资源（例如）添加到管理端点，则以这种方式声明的配置可以是WebConfigurerAdapter。

## 健康信息(Health information)

健康信息可用于检查正在运行的应用程序的状态。 如果生产系统停机，它通常被监控软件用来提醒某人。 运行状况端点公开的默认信息取决于访问方式。 对于安全应用程序中的未经身份验证的连接，将返回一个简单的“status”消息，对于已验证的连接，还会显示其他详细信息（有关HTTP详细信息，请参见[Section 48.7, “HTTP health endpoint format and access restrictions”](#_bookmark321) ）。

运行状况信息从ApplicationContext中定义的所有[HealthIndicator](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/health/HealthIndicator.java) beans中收集。 Spring Boot包含许多自动配置的HealthIndicators，您也可以编写自己的。 缺省情况下，最终系统状态由HealthAggregator派生，HealthAggregator根据状态的有序列表对每个HealthIndicator的状态进行排序。 排序列表中的第一个状态用作总体健康状态。 如果没有HealthIndicator返回HealthAggregator已知的状态，则使用UNKNOWN状态。

## (安全与健康指标)Security with HealthIndicators

由HealthIndicators返回的信息本质上通常有些敏感。 例如，您可能不想将数据库服务器的详细信息发布到世界上。 出于这个原因，默认情况下，只有健康状态暴露在未经身份验证的HTTP连接上。 如果您对完整的健康信息总是感到高兴，您可以将endpoints.health.sensitive设置为false。

还可以缓存健康响应以防止“拒绝服务”攻击。 如果要更改1000毫秒的默认缓存周期，请使用endpoints.health.time-to-live属性。

### Auto-configured HealthIndicators

以下HealthIndicators在适当情况下由Spring Boot自动配置：

| **Name** | **Description** |
| --- | --- |
| [CassandraHealthIndicator](https://github.com/spring-projects/spring-boot/tree/v1.5.9.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/health/CassandraHealthIndicator.java) | Checks that a Cassandra database is up. |
| [DiskSpaceHealthIndicator](https://github.com/spring-projects/spring-boot/tree/v1.5.9.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/health/DiskSpaceHealthIndicator.java) | Checks for low disk space. |
| [DataSourceHealthIndicator](https://github.com/spring-projects/spring-boot/tree/v1.5.9.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/health/DataSourceHealthIndicator.java) | Checks that a connection to DataSource can be obtained. |
| [ElasticsearchHealthIndicator](https://github.com/spring-projects/spring-boot/tree/v1.5.9.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/health/ElasticsearchHealthIndicator.java) | Checks that an Elasticsearch cluster is up. |
| [JmsHealthIndicator](https://github.com/spring-projects/spring-boot/tree/v1.5.9.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/health/JmsHealthIndicator.java) | Checks that a JMS broker is up. |
| [MailHealthIndicator](https://github.com/spring-projects/spring-boot/tree/v1.5.9.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/health/MailHealthIndicator.java) | Checks that a mail server is up. |
| [MongoHealthIndicator](https://github.com/spring-projects/spring-boot/tree/v1.5.9.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/health/MongoHealthIndicator.java) | Checks that a Mongo database is up. |
| [RabbitHealthIndicator](https://github.com/spring-projects/spring-boot/tree/v1.5.9.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/health/RabbitHealthIndicator.java) | Checks that a Rabbit server is up. |
| [RedisHealthIndicator](https://github.com/spring-projects/spring-boot/tree/v1.5.9.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/health/RedisHealthIndicator.java) | Checks that a Redis server is up. |
| [SolrHealthIndicator](https://github.com/spring-projects/spring-boot/tree/v1.5.9.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/health/SolrHealthIndicator.java) | Checks that a Solr server is up. |

**Tip**

可以使用management.health.defaults.enabled属性全部禁用它们。

### 编写自定义 HealthIndicators

要提供自定义健康信息，您可以注册实现HealthIndicator接口的Spring bean。 您需要提供health（）方法的实现并返回健康响应。 健康响应应该包括一个状态，并可以选择包含额外的细节来显示。

**import** org.springframework.boot.actuate.health.Health;

**import** org.springframework.boot.actuate.health.HealthIndicator;

**import** org.springframework.stereotype.Component;

@Component

**public class** MyHealthIndicator **implements** HealthIndicator {

@Override

**public** Health health() {

**int** errorCode = check(); *// perform some specific health check*

**if** (errorCode != 0) {

**return** Health.down().withDetail(***"Error Code"***, errorCode).build();

}

**return** Health.up().build();

}

}

**Note**

给定的HealthIndicator的标识符是没有HealthIndicator后缀的Bean的名称（如果存在）。 在上面的示例中，健康信息将在名为my的条目中可用。

除了Spring Boot的预定义[Status](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/health/Status.java) 类型之外，运行状况还可以返回代表新系统状态的自定义状态。 在这种情况下，还需要提供[HealthAggregator](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/health/HealthAggregator.java) 接口的自定义实现，或者必须使用management.health.status.order配置属性配置默认实现。

例如，假设您的一个HealthIndicator实现中正在使用代码为FATAL的新状态。 要配置严重性顺序，请将以下内容添加到应用程序属性中：

**management.health.status.order**=FATAL, DOWN, OUT\_OF\_SERVICE, UNKNOWN, UP

响应中的HTTP状态代码反映整体健康状况（例如，UP映射到200，OUT\_OF\_SERVICE或从DOWN到503）。 如果您通过HTTP访问运行状况端点，则可能还需要使用HealthMvcEndpoint注册自定义状态映射。 例如，以下映射FATAL到503（服务不可用）：

**endpoints.health.mapping.FATAL**=503

内置状态的默认状态映射如下：

|  |  |
| --- | --- |
| **Status**  DOWN | **Mapping**  SERVICE\_UNAVAILABLE (503) |
| OUT\_OF\_SERVICE | SERVICE\_UNAVAILABLE (503) |
| UP  UNKNOWN | No mapping by default, so http status is 200  No mapping by default, so http status is 200 |

## Application information

应用程序信息公开从ApplicationContext中定义的所有[InfoContributor](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/info/InfoContributor.java) beans收集的各种信息。 Spring Boot包含许多自动配置的InfoContributor，您也可以编写自己的。

### Auto-configured InfoContributors

以下InfoContributor可在适当情况下由Spring Boot自动配置：

| **Name** | **Description** |
| --- | --- |
| [EnvironmentInfoContributor](https://github.com/spring-projects/spring-boot/tree/v1.5.9.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/info/EnvironmentInfoContributor.java) | Expose any key from the Environmentunder the info key. |
| [GitInfoContributor](https://github.com/spring-projects/spring-boot/tree/v1.5.9.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/info/GitInfoContributor.java) | Expose git information if a git.properties file is available. |
| [BuildInfoContributor](https://github.com/spring-projects/spring-boot/tree/v1.5.9.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/info/BuildInfoContributor.java) | Expose build information if a META-INF/build-info.properties file is available. |

**Tip**

可以使用management.info.defaults.enabled属性来禁用它们。

### 自定义 application info information

您可以通过设置info.\* Spring属性来自定义信息端点公开的数据。 信息键下的所有环境属性将被自动公开。 例如，您可以将以下内容添加到您的application.properties中：

**info.app.encoding**=UTF-8 **info.app.java.source**=1.8 **info.app.java.target**=1.8

**Tip**

而不是硬编码(hardcoding)这些值，你也可以在构建时展开信息属性([expand info properties at build time](#_bookmark446))。

假设你正在使用Maven，你可以重写上面的例子，如下所示：

[**info.app.encoding**=@project.build.sourceEncoding@](mailto:info.app.encoding%3D@project.build.sourceEncoding@) [**info.app.java.source**=@java.version@](mailto:info.app.java.source%3D@java.version@) [**info.app.java.target**=@java.version@](mailto:info.app.java.target%3D@java.version@)

### Git commit information

info端点的另一个有用的功能是在构建项目时发布有关git源代码库状态的信息。 如果一个GitProperties bean可用，那么git.branch，git.commit.id和git.commit.time属性将被公开。

**Tip**

如果git.properties文件在类路径的根目录中可用，则GitProperties bean将自动配置。 有关更多详细信息，请参阅生成git信息([Generate git information](#_bookmark549) )。

如果要显示完整的git信息（即git.properties的完整内容），请使用

management.info.git.mode属性：

**management.info.git.mode**=full

### Build information

如果BuildProperties bean可用，info端点还可以发布有关您的构建的信息。 如果META-INF / build-info.properties文件在类路径中可用，则会发生这种情况。

**Tip**

Maven和Gradle插件都可以生成该文件，请参阅生成构建信息([Generate build information](#_bookmark548) )以获取更多详细信息。

### 编写自定义 InfoContributors

为了提供定制的应用程序信息，你可以注册实现了的Spring bean

[InfoContributor](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/info/InfoContributor.java) 接口。

下面的例子提供了一个具有单个值的示例条目：

**import** java.util.Collections;

**import** org.springframework.boot.actuate.info.Info;

**import** org.springframework.boot.actuate.info.InfoContributor;

**import** org.springframework.stereotype.Component;

@Component

**public class** ExampleInfoContributor **implements** InfoContributor {

@Override

**public void** contribute(Info.Builder builder) { builder.withDetail(***"example"***,

Collections.singletonMap(***"key"***, ***"value"***));

}

}

如果您点击信息端点，您应该会看到一个包含以下附加条目的响应：

**{**

***"example"***: **{**

***"key"*** : ***"value"***

**}**

**}**

# Monitoring and management over HTTP

If you are developing a Spring MVC application, Spring Boot Actuator will auto-configure all enabled endpoints to be exposed over HTTP. The default convention is to use the id of the endpoint as the URL path. For example, health is exposed as /health.

## Accessing sensitive endpoints

By default all sensitive HTTP endpoints are secured such that only users that have an ACTUATOR role may access them. Security is enforced using the standard HttpServletRequest.isUserInRole method.

**Tip**

Use the management.security.roles property if you want something different to ACTUATOR.

If you are deploying applications behind a firewall, you may prefer that all your actuator endpoints can be accessed without requiring authentication. You can do this by changing the management.security.enabled property:

**application.properties.**

**management.security.enabled**=false

**Note**

By default, actuator endpoints are exposed on the same port that serves regular HTTP traffic. Take care not to accidentally expose sensitive information if you change the management.security.enabled property.

If you’re deploying applications publicly, you may want to add ‘Spring Security’ to handle user authentication. When ‘Spring Security’ is added, by default ‘basic’ authentication will be used with the username user and a generated password (which is printed on the console when the application starts).

**Tip**

Generated passwords are logged as the application starts. Search for ‘Using default security password’.

You can use Spring properties to change the username and password and to change the security role(s) required to access the endpoints. For example, you might set the following in your application.properties:

**security.user.name**=admin **security.user.password**=secret **management.security.roles**=SUPERUSER

If your application has custom security configuration and you want all your actuator endpoints to be accessible without authentication, you need to explicitly configure that in your security configuration. Along with that, you need to change the management.security.enabled property to false.

If your custom security configuration secures your actuator endpoints, you also need to ensure that the authenticated user has the roles specified under management.security.roles.

**Tip**

If you don’t have a use case for exposing basic health information to unauthenticated users, and you have secured the actuator endpoints with custom security, you can set management.security.enabled to false. This will inform Spring Boot to skip the additional role check.

## Customizing the management endpoint paths

Sometimes it is useful to group all management endpoints under a single path. For example, your application might already use /info for another purpose. You can use the management.context- path property to set a prefix for your management endpoint:

**management.context-path**=/manage

The application.properties example above will change the endpoint from /{id} to /manage/

{id} (e.g. /manage/info).

**Note**

Unless the management port has been configured to [expose endpoints using a different HTTP](#_bookmark317) [port](#_bookmark317), management.context-path is relative to server.context-path.

You can also change the “id” of an endpoint (using endpoints.{name}.id) which then changes the default resource path for the MVC endpoint. Legal endpoint ids are composed only of alphanumeric characters (because they can be exposed in a number of places, including JMX object names, where special characters are forbidden). The MVC path can be changed separately by configuring endpoints.{name}.path, and there is no validation on those values (so you can use anything that is legal in a URL path). For example, to change the location of the /health endpoint to /ping/me you can set endpoints.health.path=/ping/me.

**Note**

Even if an endpoint path is configured separately, it is still relative to the management.context- path.

**Tip**

If you provide a custom MvcEndpoint remember to include a settable path property, and default it to /{id} if you want your code to behave like the standard MVC endpoints. (Take a look at the HealthMvcEndpoint to see how you might do that.) If your custom endpoint is an Endpoint (not an MvcEndpoint) then Spring Boot will take care of the path for you.

## Customizing the management server port

Exposing management endpoints using the default HTTP port is a sensible choice for cloud based deployments. If, however, your application runs inside your own data center you may prefer to expose endpoints using a different HTTP port.

The management.port property can be used to change the HTTP port.

**management.port**=8081

Since your management port is often protected by a firewall, and not exposed to the public you might not need security on the management endpoints, even if your main application is secure. In that case you will have Spring Security on the classpath, and you can disable management security like this:

**management.security.enabled**=false

(If you don’t have Spring Security on the classpath then there is no need to explicitly disable the management security in this way, and it might even break the application.)

## Configuring management-specific SSL

When configured to use a custom port, the management server can also be configured with its own SSL using the various management.ssl.\* properties. For example, this allows a management server to be available via HTTP while the main application uses HTTPS:

**server.port**=8443 **server.ssl.enabled**=true

**server.ssl.key-store**=classpath:store.jks **server.ssl.key-password**=secret **management.port**=8080 **management.ssl.enabled**=false

Alternatively, both the main server and the management server can use SSL but with different key stores:

**server.port**=8443 **server.ssl.enabled**=true

**server.ssl.key-store**=classpath:main.jks **server.ssl.key-password**=secret **management.port**=8080 **management.ssl.enabled**=true

**management.ssl.key-store**=classpath:management.jks **management.ssl.key-password**=secret

## Customizing the management server address

You can customize the address that the management endpoints are available on by setting the management.address property. This can be useful if you want to listen only on an internal or ops- facing network, or to only listen for connections from localhost.

**Note**

You can only listen on a different address if the port is different to the main server port.

Here is an example application.properties that will not allow remote management connections:

**management.port**=8081 **management.address**=127.0.0.1

## Disabling HTTP endpoints

If you don’t want to expose endpoints over HTTP you can set the management port to -1:

**management.port**=-1

## HTTP health endpoint format and access restrictions

The information exposed by the health endpoint varies depending on whether or not it’s accessed anonymously, and whether or not the enclosing application is secure. By default, when accessed anonymously in a secure application, any details about the server’s health are hidden and the endpoint will simply indicate whether or not the server is up or down. Furthermore the response is cached for a configurable period to prevent the endpoint being used in a denial of service attack. The endpoints.health.time-to-live property is used to configure the caching period in milliseconds. It defaults to 1000, i.e. one second.

Sample summarized HTTP response (default for anonymous request):

$ curl -i localhost:8080/health HTTP/1.1 200

X-Application-Context: application

Content-Type: application/vnd.spring-boot.actuator.v1+json;charset=UTF-8 Content-Length: 15

{"status":"UP"}

Sample summarized HTTP response for status "DOWN" (notice the 503 status code):

$ curl -i localhost:8080/health HTTP/1.1 503

X-Application-Context: application

Content-Type: application/vnd.spring-boot.actuator.v1+json;charset=UTF-8 Content-Length: 17

{"status":"DOWN"}

Sample detailed HTTP response:

$ curl -i localhost:8080/health HTTP/1.1 200 OK

X-Application-Context: application

Content-Type: application/vnd.spring-boot.actuator.v1+json;charset=UTF-8 Content-Length: 221

{

"status" : "UP", "diskSpace" : {

"status" : "UP", "total" : 63251804160,

"free" : 31316164608,

"threshold" : 10485760

},

"db" : {

"status" : "UP",

"database" : "H2", "hello" : 1

}

}

The above-described restrictions can be enhanced, thereby allowing only authenticated users full access to the health endpoint in a secure application. To do so, set endpoints.health.sensitive to true. Here’s a summary of behavior (with default sensitive flag value “false” indicated in bold):

|  |  |  |
| --- | --- | --- |
| **management.securit** | **ye.nednpaobilnetds.health.seUnsniauttihveenticated** | **Authenticated (with right role)** |
| false | \* Full content | Full content |

|  |  |  |
| --- | --- | --- |
| **management.securit** | **ye.nednpaobilnetds.health.seUnsniauttihveenticated** | **Authenticated (with right role)** |
| true  true | **false** Status only  true No content | Full content  Full content |

# Monitoring and management over JMX

Java Management Extensions (JMX) provide a standard mechanism to monitor and manage applications. By default Spring Boot will expose management endpoints as JMX MBeans under the org.springframework.boot domain.

## Customizing MBean names

The name of the MBean is usually generated from the id of the endpoint. For example the health

endpoint is exposed as org.springframework.boot/Endpoint/healthEndpoint.

If your application contains more than one Spring ApplicationContext you may find that names clash. To solve this problem you can set the endpoints.jmx.unique-names property to true so that MBean names are always unique.

You can also customize the JMX domain under which endpoints are exposed. Here is an example

application.properties:

**endpoints.jmx.domain**=myapp **endpoints.jmx.unique-names**=true

## Disabling JMX endpoints

If you don’t want to expose endpoints over JMX you can set the endpoints.jmx.enabled property to false:

**endpoints.jmx.enabled**=false

## Using Jolokia for JMX over HTTP

Jolokia is a JMX-HTTP bridge giving an alternative method of accessing JMX beans. To use Jolokia, simply include a dependency to org.jolokia:jolokia-core. For example, using Maven you would add the following:

**<dependency>**

**<groupId>**org.jolokia**</groupId>**

**<artifactId>**jolokia-core**</artifactId>**

**</dependency>**

Jolokia can then be accessed using /jolokia on your management HTTP server.

### Customizing Jolokia

Jolokia has a number of settings that you would traditionally configure using servlet parameters. With Spring Boot you can use your application.properties, simply prefix the parameter with jolokia.config.:

**jolokia.config.debug**=true

### Disabling Jolokia

If you are using Jolokia but you don’t want Spring Boot to configure it, simply set the

endpoints.jolokia.enabled property to false:

**endpoints.jolokia.enabled**=false

# Monitoring and management using a remote shell (deprecated)

Spring Boot supports an integrated Java shell called ‘CRaSH’. You can use CRaSH to ssh or telnet into your running application. To enable remote shell support, add the following dependency to your project:

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-remote-shell**</artifactId>**

**</dependency>**

**Note**

The remote shell is deprecated and will be removed in Spring Boot 2.0.

**Tip**

If you want to also enable telnet access you will additionally need a dependency on

org.crsh:crsh.shell.telnet.

**Note**

CRaSH requires to run with a JDK as it compiles commands on the fly. If a basic help command fails, you are probably running with a JRE.

## Connecting to the remote shell

By default the remote shell will listen for connections on port 2000. The default user is user and the default password will be randomly generated and displayed in the log output. If your application is using Spring Security, the shell will use [the same configuration](#_bookmark156) by default. If not, a simple authentication will be applied and you should see a message like this:

Using default password for shell access: ec03e16c-4cf4-49ee-b745-7c8255c1dd7e

Linux and OSX users can use ssh to connect to the remote shell, Windows users can download and install [PuTTY](http://www.putty.org/).

/\\ / '\_ \_ \_(\_)\_ \_ \ \ \ \ ( ( )\ | '\_ | '\_| | '\_ \/ \_` | \ \ \ \

\\/ )| |\_)| | | | | || (\_| | ) ) ) ) ' | | . |\_| |\_|\_| |\_\ , | / / / /

=========|\_|==============| /=/\_/\_/\_/

:: Spring Boot :: (v1.5.8.RELEASE) on myhost

\_ \_

$ ssh -p 2000 user@localhost

user@localhost's password:

. \_

Type help for a list of commands. Spring Boot provides metrics, beans, autoconfig and endpoint

commands.

### Remote shell credentials

You can use the management.shell.auth.simple.user.name and management.shell.auth.simple.user.password properties to configure custom connection credentials. It is also possible to use a ‘Spring Security’ AuthenticationManager to handle login duties. See the [CrshAutoConfiguration](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/CrshAutoConfiguration.html) and [ShellProperties](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/ShellProperties.html) Javadoc for full details.

## Extending the remote shell

The remote shell can be extended in a number of interesting ways.

### Remote shell commands

You can write additional shell commands using Groovy (see the CRaSH documentation for details). Due to limitations in CRaSH’s Java compiler, commands written in Java are not supported. By default Spring Boot will search for commands in the following locations:

* classpath\*:/commands/\*\*
* classpath\*:/crash/commands/\*\*

**Tip**

You can change the search path by settings a shell.command-path-patterns property.

**Note**

If you are using an executable archive, any classes that a shell command depends upon must be packaged in a nested jar rather than directly in the executable jar or war.

Here is a simple ‘hello’ command that could be loaded from src/main/resources/commands/ hello.groovy

**package** commands

**import** org.crsh.cli.Command

**import** org.crsh.cli.Usage

**import** org.crsh.command.InvocationContext

**class** hello {

@Usage("Say Hello") @Command

def main(InvocationContext context) {

**return *"Hello"***

}

}

Spring Boot adds some additional attributes to InvocationContext that you can access from your command:

|  |
| --- |
| **Attribute Name Description** |
| spring.boot.version The version of Spring Boot  spring.version The version of the core Spring Framework |

|  |
| --- |
| **Attribute Name Description** |
| spring.beanfactory Access to the Spring BeanFactory  spring.environment Access to the Spring Environment |

### Remote shell plugins

In addition to new commands, it is also possible to extend other CRaSH shell features. All Spring Beans that extend org.crsh.plugin.CRaSHPlugin will be automatically registered with the shell.

For more information please refer to the [CRaSH reference documentation](http://www.crashub.org/).

# Loggers

Spring Boot Actuator能够在运行时查看和配置应用程序的日志级别。 您可以查看整个列表或单个记录器的配置，该配置由显式配置的日志记录级别以及记录框架给出的有效日志记录级别组成。 这些级别可以是：

* TRACE
* DEBUG
* INFO
* WARN
* ERROR
* FATAL
* OFF
* null

用null表示没有明确的配置。

## 配置 Logger

为了配置一个给定的记录器，可以将一个部分实体发布到资源的URI：

**{**

***"configuredLevel"***: ***"DEBUG"***

**}**

# Metrics

Spring Boot Actuator includes a metrics service with ‘gauge’ and ‘counter’ support. A ‘gauge’ records a single value; and a ‘counter’ records a delta (an increment or decrement). Spring Boot Actuator also provides a [PublicMetrics](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/endpoint/PublicMetrics.java) interface that you can implement to expose metrics that you cannot record via one of those two mechanisms. Look at [SystemPublicMetrics](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/endpoint/SystemPublicMetrics.java) for an example.

Metrics for all HTTP requests are automatically recorded, so if you hit the metrics endpoint you should see a response similar to this:

**{**

***"counter.status.200.root"***: 20**,**

***"counter.status.200.metrics"***: 3**,**

***"counter.status.200.star-star"***: 5**,**

***"counter.status.401.root"***: 4**,**

***"gauge.response.star-star"***: 6**,**

***"gauge.response.root"***: 2**,**

***"gauge.response.metrics"***: 3**,**

***"classes"***: 5808**,**

***"classes.loaded"***: 5808**,**

***"classes.unloaded"***: 0**,**

***"heap"***: 3728384**,**

***"heap.committed"***: 986624**,**

***"heap.init"***: 262144**,**

***"heap.used"***: 52765**,**

***"nonheap"***: 0**,**

***"nonheap.committed"***: 77568**,**

***"nonheap.init"***: 2496**,**

***"nonheap.used"***: 75826**,**

***"mem"***: 986624**,**

***"mem.free"***: 933858**,**

***"processors"***: 8**,**

***"threads"***: 15**,**

***"threads.daemon"***: 11**,**

***"threads.peak"***: 15**,**

***"threads.totalStarted"***: 42**,**

***"uptime"***: 494836**,**

***"instance.uptime"***: 489782**,**

***"datasource.primary.active"***: 5**,**

***"datasource.primary.usage"***: 0.25

**}**

Here we can see basic memory, heap, class loading, processor and thread pool information along with some HTTP metrics. In this instance the root (‘/’) and /metrics URLs have returned HTTP 200 responses 20 and 3 times respectively. It also appears that the root URL returned HTTP 401 (unauthorized) 4 times. The double asterisks (star-star) comes from a request matched by Spring MVC as /\*\* (normally a static resource).

The gauge shows the last response time for a request. So the last request to root took 2ms to respond and the last to /metrics took 3ms.

**Note**

In this example we are actually accessing the endpoint over HTTP using the /metrics URL, this explains why metrics appears in the response.

## System metrics

The following system metrics are exposed by Spring Boot:

* The total system memory in KB (mem)
* The amount of free memory in KB (mem.free)
* The number of processors (processors)
* The system uptime in milliseconds (uptime)
* The application context uptime in milliseconds (instance.uptime)
* The average system load (systemload.average)
* Heap information in KB (heap, heap.committed, heap.init, heap.used)
* Thread information (threads, thread.peak, thread.daemon)
* Class load information (classes, classes.loaded, classes.unloaded)
* Garbage collection information (gc.xxx.count, gc.xxx.time)

## DataSource metrics

The following metrics are exposed for each supported DataSource defined in your application:

* The number of active connections (datasource.xxx.active)
* The current usage of the connection pool (datasource.xxx.usage).

All data source metrics share the datasource. prefix. The prefix is further qualified for each data source:

* If the data source is the primary data source (that is either the only available data source or the one flagged @Primary amongst the existing ones), the prefix is datasource.primary.
* If the data source bean name ends with DataSource, the prefix is the name of the bean without

DataSource (i.e. datasource.batch for batchDataSource).

* In all other cases, the name of the bean is used.

It is possible to override part or all of those defaults by registering a bean with a customized version of DataSourcePublicMetrics. By default, Spring Boot provides metadata for all supported data sources; you can add additional DataSourcePoolMetadataProvider beans if your favorite data source isn’t supported out of the box. See DataSourcePoolMetadataProvidersConfiguration for examples.

## Cache metrics

The following metrics are exposed for each supported cache defined in your application:

* The current size of the cache (cache.xxx.size)
* Hit ratio (cache.xxx.hit.ratio)
* Miss ratio (cache.xxx.miss.ratio)

**Note**

Cache providers do not expose the hit/miss ratio in a consistent way. While some expose an

**aggregated** value (i.e. the hit ratio since the last time the stats were cleared), others expose a

**temporal** value (i.e. the hit ratio of the last second). Check your caching provider documentation for more details.

If two different cache managers happen to define the same cache, the name of the cache is prefixed by the name of the CacheManager bean.

It is possible to override part or all of those defaults by registering a bean with a customized version of CachePublicMetrics. By default, Spring Boot provides cache statistics for EhCache, Hazelcast, Infinispan, JCache and Guava. You can add additional CacheStatisticsProvider beans if your favorite caching library isn’t supported out of the box. See CacheStatisticsAutoConfiguration for examples.

## Tomcat session metrics

If you are using Tomcat as your embedded servlet container, session metrics will automatically be exposed. The httpsessions.active and httpsessions.max keys provide the number of active and maximum sessions.

## Recording your own metrics

To record your own metrics inject a [CounterService](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/metrics/CounterService.java) and/or [GaugeService](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/metrics/GaugeService.java) into your bean. The CounterService exposes increment, decrement and reset methods; the GaugeService provides a submit method.

Here is a simple example that counts the number of times that a method is invoked:

**import** org.springframework.beans.factory.annotation.Autowired; **import** org.springframework.boot.actuate.metrics.CounterService; **import** org.springframework.stereotype.Service;

@Service

**public class** MyService {

**private final** CounterService counterService; @Autowired

**public** MyService(CounterService counterService) {

**this**.counterService = counterService;

}

**public void** exampleMethod() {

**this**.counterService.increment(***"services.system.myservice.invoked"***);

}

}

**Tip**

You can use any string as a metric name but you should follow guidelines of your chosen store/ graphing technology. Some good guidelines for Graphite are available on [Matt Aimonetti’s Blog](http://matt.aimonetti.net/posts/2013/06/26/practical-guide-to-graphite-monitoring/).

## Adding your own public metrics

To add additional metrics that are computed every time the metrics endpoint is invoked, simply register additional PublicMetrics implementation bean(s). By default, all such beans are gathered by the endpoint. You can easily change that by defining your own MetricsEndpoint.

## Special features with Java 8

The default implementation of GaugeService and CounterService provided by Spring Boot depends on the version of Java that you are using. With Java 8 (or better) the implementation switches to a high-performance version optimized for fast writes, backed by atomic in-memory buffers, rather than by the immutable but relatively expensive Metric<?> type (counters are approximately 5 times faster and gauges approximately twice as fast as the repository-based implementations). The Dropwizard metrics services (see below) are also very efficient even for Java 7 (they have backports of some of the Java 8 concurrency libraries), but they do not record timestamps for metric values. If performance of metric gathering is a concern then it is always advisable to use one of the high-performance options, and also to only read metrics infrequently, so that the writes are buffered locally and only read when needed.

**Note**

The old MetricRepository and its InMemoryMetricRepository implementation are not used by default if you are on Java 8 or if you are using Dropwizard metrics.

## Metric writers, exporters and aggregation

Spring Boot provides a couple of implementations of a marker interface called Exporter which can be used to copy metric readings from the in-memory buffers to a place where they can be analyzed and displayed. Indeed, if you provide a @Bean that implements the MetricWriter interface (or GaugeWriter for simple use cases) and mark it @ExportMetricWriter, then it will automatically be hooked up to an Exporter and fed metric updates every 5 seconds (configured via spring.metrics.export.delay-millis). In addition, any MetricReader that you define and mark as @ExportMetricReader will have its values exported by the default exporter.

**Note**

This feature is enabling scheduling in your application (@EnableScheduling) which can be a problem if you run an integration test as your own scheduled tasks will start. You can disable this behaviour by setting spring.metrics.export.enabled to false.

The default exporter is a MetricCopyExporter which tries to optimize itself by not copying values that haven’t changed since it was last called (the optimization can be switched off using a flag spring.metrics.export.send-latest). Note also that the Dropwizard MetricRegistry has no support for timestamps, so the optimization is not available if you are using Dropwizard metrics (all metrics will be copied on every tick).

The default values for the export trigger (delay-millis, includes, excludes and send-latest) can be set as spring.metrics.export.\*. Individual values for specific MetricWriters can be set as spring.metrics.export.triggers.<name>.\* where <name> is a bean name (or pattern for matching bean names).

**Warning**

The automatic export of metrics is disabled if you switch off the default MetricRepository (e.g. by using Dropwizard metrics). You can get back the same functionality be declaring a bean of your own of type MetricReader and declaring it to be @ExportMetricReader.

### Example: Export to Redis

If you provide a @Bean of type RedisMetricRepository and mark it @ExportMetricWriter the metrics are exported to a Redis cache for aggregation. The RedisMetricRepository has two important parameters to configure it for this purpose: prefix and key (passed into its constructor). It is best to use a prefix that is unique to the application instance (e.g. using a random value and maybe the logical name of the application to make it possible to correlate with other instances of the same application). The “key” is used to keep a global index of all metric names, so it should be unique “globally”, whatever that means for your system (e.g. two instances of the same system could share a Redis cache if they have distinct keys).

Example:

@Bean @ExportMetricWriter

MetricWriter metricWriter(MetricExportProperties export) {

**return new** RedisMetricRepository(connectionFactory, export.getRedis().getPrefix(), export.getRedis().getKey());

}

**application.properties.**

**spring.metrics.export.redis.prefix**: metrics.mysystem.${spring.application.name:application}.

${random.value:0000}

**spring.metrics.export.redis.key**: keys.metrics.mysystem

The prefix is constructed with the application name and id at the end, so it can easily be used to identify a group of processes with the same logical name later.

**Note**

It’s important to set both the key and the prefix. The key is used for all repository operations, and can be shared by multiple repositories. If multiple repositories share a key (like in the case where you need to aggregate across them), then you normally have a read-only “master” repository that has a short, but identifiable, prefix (like “metrics.mysystem”), and many write-only repositories with prefixes that start with the master prefix (like metrics.mysystem.\* in the example above). It is efficient to read all the keys from a “master” repository like that, but inefficient to read a subset with a longer prefix (e.g. using one of the writing repositories).

**Tip**

The example above uses MetricExportProperties to inject and extract the key and prefix. This is provided to you as a convenience by Spring Boot, configured with sensible defaults. There is nothing to stop you using your own values as long as they follow the recommendations.

### Example: Export to Open TSDB

If you provide a @Bean of type OpenTsdbGaugeWriter and mark it @ExportMetricWriter metrics are exported to [Open TSDB](http://opentsdb.net/) for aggregation. The OpenTsdbGaugeWriter has a url property that you need to set to the Open TSDB “/put” endpoint, e.g. localhost:4242/api/put). It also has a namingStrategy that you can customize or configure to make the metrics match the data structure you need on the server. By default it just passes through the metric name as an Open TSDB metric name, and adds the tags “domain” (with value “org.springframework.metrics”) and “process” (with the

value equal to the object hash of the naming strategy). Thus, after running the application and generating some metrics you can inspect the metrics in the TSD UI (localhost:4242 by default).

Example:

curl localhost:4242/api/query?start=1h-ago&m=max:counter.status.200.root [

{

"metric": "counter.status.200.root", "tags": {

"domain": "org.springframework.metrics", "process": "b968a76"

},

"aggregateTags": [], "dps": {

"1430492872": 2,

"1430492875": 6

}

}

]

### Example: Export to Statsd

To export metrics to Statsd, make sure first that you have added com.timgroup:java-statsd- client as a dependency of your project (Spring Boot provides a dependency management for it). Then add a spring.metrics.export.statsd.host value to your application.properties file. Connections will be opened to port 8125 unless a spring.metrics.export.statsd.port override is provided. You can use spring.metrics.export.statsd.prefix if you want a custom prefix.

Alternatively, you can provide a @Bean of type StatsdMetricWriter and mark it

@ExportMetricWriter:

@Value("${spring.application.name:application}.${random.value:0000}")

**private** String prefix = ***"metrics"***;

@Bean @ExportMetricWriter

MetricWriter metricWriter() {

**return new** StatsdMetricWriter(prefix, ***"localhost"***, 8125);

}

### Example: Export to JMX

If you provide a @Bean of type JmxMetricWriter marked @ExportMetricWriter the metrics are exported as MBeans to the local server (the MBeanExporter is provided by Spring Boot JMX auto- configuration as long as it is switched on). Metrics can then be inspected, graphed, alerted etc. using any tool that understands JMX (e.g. JConsole or JVisualVM).

Example:

@Bean @ExportMetricWriter

MetricWriter metricWriter(MBeanExporter exporter) {

**return new** JmxMetricWriter(exporter);

}

Each metric is exported as an individual MBean. The format for the ObjectNames is given by an ObjectNamingStrategy which can be injected into the JmxMetricWriter (the default breaks up the metric name and tags the first two period-separated sections in a way that should make the metrics group nicely in JVisualVM or JConsole).

## Aggregating metrics from multiple sources

There is an AggregateMetricReader that you can use to consolidate metrics from different physical sources. Sources for the same logical metric just need to publish them with a period-separated prefix, and the reader will aggregate (by truncating the metric names, and dropping the prefix). Counters are summed and everything else (i.e. gauges) take their most recent value.

This is very useful if multiple application instances are feeding to a central (e.g. Redis) repository and you want to display the results. Particularly recommended in conjunction with a MetricReaderPublicMetrics for hooking up to the results to the “/metrics” endpoint.

Example:

@Autowired

**private** MetricExportProperties export;

@Bean

**public** PublicMetrics metricsAggregate() {

**return new** MetricReaderPublicMetrics(aggregatesMetricReader());

}

**private** MetricReader globalMetricsForAggregation() {

**return new** RedisMetricRepository(**this**.connectionFactory,

**this**.export.getRedis().getAggregatePrefix(), **this**.export.getRedis().getKey());

}

**private** MetricReader aggregatesMetricReader() { AggregateMetricReader repository = **new** AggregateMetricReader(

globalMetricsForAggregation());

**return** repository;

}

**Note**

The example above uses MetricExportProperties to inject and extract the key and prefix. This is provided to you as a convenience by Spring Boot, and the defaults will be sensible. They are set up in MetricExportAutoConfiguration.

**Note**

The MetricReaders above are not @Beans and are not marked as @ExportMetricReader because they are just collecting and analyzing data from other repositories, and don’t want to export their values.

## Dropwizard Metrics

A default MetricRegistry Spring bean will be created when you declare a dependency to the io.dropwizard.metrics:metrics-core library; you can also register you own @Bean instance if you need customizations. Users of the [Dropwizard ‘Metrics’ library](https://dropwizard.github.io/metrics/) will find that Spring Boot metrics are automatically published to com.codahale.metrics.MetricRegistry. Metrics from the MetricRegistry are also automatically exposed via the /metrics endpoint

When Dropwizard metrics are in use, the default CounterService and GaugeService are replaced with a DropwizardMetricServices, which is a wrapper around the MetricRegistry (so you can @Autowired one of those services and use it as normal). You can also create “special” Dropwizard metrics by prefixing your metric names with the appropriate type (i.e. timer.\*, histogram.\* for gauges, and meter.\* for counters).

## Message channel integration

If a MessageChannel bean called metricsChannel exists, then a MetricWriter will be created that writes metrics to that channel. Each message sent to the channel will contain a [Delta](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/metrics/writer/Delta.html) or [Metric](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/metrics/Metric.html) payload and have a metricName header. The writer is automatically hooked up to an exporter (as for all writers), so all metric values will appear on the channel, and additional analysis or actions can be taken by subscribers (it’s up to you to provide the channel and any subscribers you need).

# Auditing

Spring Boot Actuator has a flexible audit framework that will publish events once Spring Security is in play (‘authentication success’, ‘failure’ and ‘access denied’ exceptions by default). This can be very useful for reporting, and also to implement a lock-out policy based on authentication failures. To customize published security events you can provide your own implementations of AbstractAuthenticationAuditListener and AbstractAuthorizationAuditListener.

You can also choose to use the audit services for your own business events. To do that you can either inject the existing AuditEventRepository into your own components and use that directly, or you can simply publish AuditApplicationEvent via the Spring ApplicationEventPublisher (using ApplicationEventPublisherAware).

# Tracing

Tracing is automatically enabled for all HTTP requests. You can view the trace endpoint and obtain basic information about the last 100 requests:

[**{**

***"timestamp"***: 1394343677415**,**

***"info"***: **{**

***"method"***: ***"GET"*,**

***"path"***: ***"/trace"*, *"headers"***: **{**

***"request"***: **{**

***"Accept"***: ***"text/html,application/xhtml+xml,application/xml;q=0.9,\*/\*;q=0.8"*, *"Connection"***: ***"keep-alive"*,**

***"Accept-Encoding"***: ***"gzip, deflate"*,**

***"User-Agent"***: ***"Mozilla/5.0 Gecko/Firefox"*, *"Accept-Language"***: ***"en-US,en;q=0.5"*,**

***"Cookie"***: ***"\_ga=GA1.1.827067509.1390890128; ..."***

***"Authorization"***: ***"Basic ..."*, *"Host"***: ***"localhost:8080"***

**},**

***"response"***: **{**

***"Strict-Transport-Security"***: ***"max-age=31536000 ; includeSubDomains"*, *"X-Application-Context"***: ***"application:8080"*,**

***"Content-Type"***: ***"application/json;charset=UTF-8"*, *"status"***: ***"200"***

**}**

**}**

**}**

},**{**

***"timestamp"***: 1394343684465**,**

...

**}]**

The following are included in the trace by default:

|  |  |
| --- | --- |
| **Name**  Request Headers | **Description**  Headers from the request. |
| Response Headers | Headers from the response. |
| Cookies | Cookie from request headers and Set-Cookie from response headers. |
| Errors | The error attributes (if any). |
| Time Taken | The time taken to service the request in milliseconds. |

## Custom tracing

If you need to trace additional events you can inject a [TraceRepository](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/trace/TraceRepository.java) into your Spring beans. The

add method accepts a single Map structure that will be converted to JSON and logged.

By default an InMemoryTraceRepository will be used that stores the last 100 events. You can define your own instance of the InMemoryTraceRepository bean if you need to expand the capacity. You can also create your own alternative TraceRepository implementation if needed.

# Process monitoring

In Spring Boot Actuator you can find a couple of classes to create files that are useful for process monitoring:

* ApplicationPidFileWriter creates a file containing the application PID (by default in the application directory with the file name application.pid).
* EmbeddedServerPortFileWriter creates a file (or files) containing the ports of the embedded server (by default in the application directory with the file name application.port).

These writers are not activated by default, but you can enable them in one of the ways described below.

## Extend configuration

In META-INF/spring.factories file you can activate the listener(s) that writes a PID file. Example:

org.springframework.context.ApplicationListener=\ org.springframework.boot.system.ApplicationPidFileWriter,\ org.springframework.boot.actuate.system.EmbeddedServerPortFileWriter

## Programmatically

You can also activate a listener by invoking the SpringApplication.addListeners(…) method and passing the appropriate Writer object. This method also allows you to customize the file name and path via the Writer constructor.

# Cloud Foundry support

Spring Boot’s actuator module includes additional support that is activated when you deploy to a compatible Cloud Foundry instance. The /cloudfoundryapplication path provides an alternative secured route to all NamedMvcEndpoint beans.

The extended support allows Cloud Foundry management UIs (such as the web application that you can use to view deployed applications) to be augmented with Spring Boot actuator information. For example, an application status page may include full health information instead of the typical “running” or “stopped” status.

**Note**

The /cloudfoundryapplication path is not directly accessible to regular users. In order to use the endpoint a valid UAA token must be passed with the request.

## Disabling extended Cloud Foundry actuator support

If you want to fully disable the /cloudfoundryapplication endpoints you can add the following to your application.properties file:

**application.properties.**

**management.cloudfoundry.enabled**=false

## Cloud Foundry self signed certificates

By default, the security verification for /cloudfoundryapplication endpoints makes SSL calls to various Cloud Foundry services. If your Cloud Foundry UAA or Cloud Controller services use self-signed certificates you will need to set the following property:

**application.properties.**

**management.cloudfoundry.skip-ssl-validation**=true

## Custom security configuration

If you define custom security configuration, and you want extended Cloud Foundry actuator support, you’ll should ensure that /cloudfoundryapplication/\*\* paths are open. Without a direct open route, your Cloud Foundry application manager will not be able to obtain endpoint data.

For Spring Security, you’ll typically include something like mvcMatchers("/ cloudfoundryapplication/\*\*").permitAll() in your configuration:

@Override

**protected void** configure(HttpSecurity http) **throws** Exception { http

.authorizeRequests()

.mvcMatchers(***"/cloudfoundryapplication/\*\*"***)

.permitAll()

.mvcMatchers(***"/mypath"***)

.hasAnyRole(***"SUPERUSER"***)

.anyRequest()

.authenticated().and()

.httpBasic();

}

# What to read next

If you want to explore some of the concepts discussed in this chapter, you can take a look at the actuator [sample applications](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples). You also might want to read about graphing tools such as [Graphite](http://graphite.wikidot.com/).

Otherwise, you can continue on, to read about [‘deployment options’](#_bookmark363) or jump ahead for some in-depth information about Spring Boot’s [*build tool plugins*](#_bookmark407).

**Part VI. Deploying Spring Boot applications**

Spring Boot’s flexible packaging options provide a great deal of choice when it comes to deploying your application. You can easily deploy Spring Boot applications to a variety of cloud platforms, to a container images (such as Docker) or to virtual/real machines.

This section covers some of the more common deployment scenarios.

# Deploying to the cloud

Spring Boot’s executable jars are ready-made for most popular cloud PaaS (platform-as-a-service) providers. These providers tend to require that you “bring your own container”; they manage application processes (not Java applications specifically), so they need some intermediary layer that adapts *your* application to the *cloud’s* notion of a running process.

Two popular cloud providers, Heroku and Cloud Foundry, employ a “buildpack” approach. The buildpack wraps your deployed code in whatever is needed to *start* your application: it might be a JDK and a call to java, it might be an embedded web server, or it might be a full-fledged application server. A buildpack is pluggable, but ideally you should be able to get by with as few customizations to it as possible. This reduces the footprint of functionality that is not under your control. It minimizes divergence between development and production environments.

Ideally, your application, like a Spring Boot executable jar, has everything that it needs to run packaged within it.

In this section we’ll look at what it takes to get the [simple application that we developed](#_bookmark24) in the “Getting Started” section up and running in the Cloud.

## Cloud Foundry

Cloud Foundry provides default buildpacks that come into play if no other buildpack is specified. The Cloud Foundry [Java buildpack](https://github.com/cloudfoundry/java-buildpack) has excellent support for Spring applications, including Spring Boot. You can deploy stand-alone executable jar applications, as well as traditional .war packaged applications.

Once you’ve built your application (using, for example, mvn clean package) and [installed the cf](http://docs.cloudfoundry.org/devguide/installcf/install-go-cli.html) [command line tool](http://docs.cloudfoundry.org/devguide/installcf/install-go-cli.html), simply deploy your application using the cf push command as follows, substituting the path to your compiled .jar. Be sure to have [logged in with your cf command line client](http://docs.cloudfoundry.org/devguide/installcf/whats-new-v6.html#login) before pushing an application.

$ cf push acloudyspringtime -p target/demo-0.0.1-SNAPSHOT.jar

See the [cf push documentation](http://docs.cloudfoundry.org/devguide/installcf/whats-new-v6.html#push) for more options. If there is a Cloud Foundry [manifest.yml](http://docs.cloudfoundry.org/devguide/deploy-apps/manifest.html) file present in the same directory, it will be consulted.

**Note**

Here we are substituting acloudyspringtime for whatever value you give cf as the name of your application.

At this point cf will start uploading your application:

Uploading acloudyspringtime... **OK**

Preparing to start acloudyspringtime... **OK**

-----> Downloaded app package (**8.9M**)

-----> Java Buildpack source: system

-----> Downloading Open JDK 1.7.0\_51 from .../x86\_64/openjdk-1.7.0\_51.tar.gz (**1.8s**) Expanding Open JDK to .java-buildpack/open\_jdk (**1.2s**)

-----> Downloading Spring Auto Reconfiguration from 0.8.7 .../auto-reconfiguration-0.8.7.jar (**0.1s**)

-----> Uploading droplet (**44M**)

Checking status of app 'acloudyspringtime'...

0 of 1 instances running (1 starting)

...

0 of 1 instances running (1 down)

...

0 of 1 instances running (1 starting)

...

1 of 1 instances running (1 running)

App started

Congratulations! The application is now live!

It’s easy to then verify the status of the deployed application:

$ cf apps

Getting applications in ... OK

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| name | requested state | instances | memory | disk | urls |
| ... |  |  |  |  |  |
| acloudyspringtime | started | 1/1 | 512M | 1G | acloudyspringtime.cfapps.io |
| ... |  |  |  |  |  |

Once Cloud Foundry acknowledges that your application has been deployed, you should be able to hit the application at the URI given, in this case [http://acloudyspringtime.cfapps.io/.](http://acloudyspringtime.cfapps.io/)

### Binding to services

By default, metadata about the running application as well as service connection information is exposed to the application as environment variables (for example: $VCAP\_SERVICES). This architecture decision is due to Cloud Foundry’s polyglot (any language and platform can be supported as a buildpack) nature; process-scoped environment variables are language agnostic.

Environment variables don’t always make for the easiest API so Spring Boot automatically extracts them and flattens the data into properties that can be accessed through Spring’s Environment abstraction:

@Component

**class** MyBean **implements** EnvironmentAware {

**private** String instanceId; @Override

**public void** setEnvironment(Environment environment) {

**this**.instanceId = environment.getProperty(***"vcap.application.instance\_id"***);

}

*// ...*

}

All Cloud Foundry properties are prefixed with vcap. You can use vcap properties to access application information (such as the public URL of the application) and service information (such as database credentials). See CloudFoundryVcapEnvironmentPostProcessor Javadoc for complete details.

**Tip**

The [Spring Cloud Connectors](http://cloud.spring.io/spring-cloud-connectors/) project is a better fit for tasks such as configuring a DataSource. Spring Boot includes auto-configuration support and a spring-boot-starter-cloud- connectors starter.

## Heroku

Heroku is another popular PaaS platform. To customize Heroku builds, you provide a Procfile, which provides the incantation required to deploy an application. Heroku assigns a port for the Java application to use and then ensures that routing to the external URI works.

You must configure your application to listen on the correct port. Here’s the Procfile for our starter REST application:

web: java -Dserver.port=$PORT -jar target/demo-0.0.1-SNAPSHOT.jar

Spring Boot makes -D arguments available as properties accessible from a Spring Environment instance. The server.port configuration property is fed to the embedded Tomcat, Jetty or Undertow instance which then uses it when it starts up. The $PORT environment variable is assigned to us by the Heroku PaaS.

Heroku by default will use Java 1.8. This is fine as long as your Maven or Gradle build is set to use the same version (Maven users can use the java.version property). If you want to use JDK 1.7, create a new file adjacent to your pom.xml and Procfile, called system.properties. In this file add the following:

java.runtime.version=1.7

This should be everything you need. The most common workflow for Heroku deployments is to git push the code to production.

$ git push heroku master

Initializing repository, **done**. Counting objects: 95, **done**.

Delta compression using up to 8 threads. Compressing objects: 100% (78/78), **done**.

Writing objects: 100% (95/95), 8.66 MiB | 606.00 KiB/s, **done**. Total 95 (delta 31), reused 0 (delta 0)

-----> Java app detected

-----> Installing OpenJDK 1.8... **done**

-----> Installing Maven 3.3.1... **done**

-----> Installing settings.xml... **done**

-----> Executing: mvn -B -DskipTests=true clean install

[INFO] Scanning for projects... [Downloading: http://repo.spring.io/...](http://repo.spring.io/)

[Downloaded: http://repo.spring.io/...](http://repo.spring.io/) (818 B at 1.8 KB/sec)

....

[Downloaded: http://s3pository.heroku.com/jvm/...](http://s3pository.heroku.com/jvm/) (152 KB at 595.3 KB/sec) [INFO] Installing /tmp/build\_0c35a5d2-a067-4abc-a232-14b1fb7a8229/target/... [INFO] Installing /tmp/build\_0c35a5d2-a067-4abc-a232-14b1fb7a8229/pom.xml ... [INFO] ------------------------------------------------------------------------ [INFO] **BUILD SUCCESS**

[INFO] ------------------------------------------------------------------------

[INFO] Total time: 59.358s

[INFO] Finished at: Fri Mar 07 07:28:25 UTC 2014 [INFO] Final Memory: 20M/493M

[INFO] ------------------------------------------------------------------------

-----> Discovering process types Procfile declares types -> **web**

-----> Compressing... **done**, 70.4MB

-----> Launching... **done**, v6

<http://agile-sierra-1405.herokuapp.com/>**deployed to Heroku**

To git@heroku.com:agile-sierra-1405.git

\* [new branch] master -> master

Your application should now be up and running on Heroku.

## OpenShift

[OpenShift](https://www.openshift.com/) is the RedHat public (and enterprise) PaaS solution. Like Heroku, it works by running scripts triggered by git commits, so you can script the launching of a Spring Boot application in pretty much any way you like as long as the Java runtime is available (which is a standard feature you can ask for at OpenShift). To do this you can use the [DIY Cartridge](https://www.openshift.com/developers/do-it-yourself) and hooks in your repository under .openshift/ action\_hooks:

The basic model is to:

1. Ensure Java and your build tool are installed remotely, e.g. using a pre\_build hook (Java and Maven are installed by default, Gradle is not)
2. Use a build hook to build your jar (using Maven or Gradle), e.g.

#!/bin/bash

cd $OPENSHIFT\_REPO\_DIR

mvn package -s .openshift/settings.xml -DskipTests=true

1. Add a start hook that calls java -jar …

#!/bin/bash

cd $OPENSHIFT\_REPO\_DIR

nohup java -jar target/\*.jar --server.port=${OPENSHIFT\_DIY\_PORT} --server.address=${OPENSHIFT\_DIY\_IP} &

1. Use a stop hook (since the start is supposed to return cleanly), e.g.

#!/bin/bash

source $OPENSHIFT\_CARTRIDGE\_SDK\_BASH

PID=$(ps -ef | grep java.\*\.jar | grep -v grep | awk '{ print $2 }') if [ -z "$PID" ]

then

client\_result "Application is already stopped"

else

kill $PID

fi

1. Embed service bindings from environment variables provided by the platform in your

application.properties, e.g.

spring.datasource.url: jdbc:mysql://${OPENSHIFT\_MYSQL\_DB\_HOST}:${OPENSHIFT\_MYSQL\_DB\_PORT}/

${OPENSHIFT\_APP\_NAME}

spring.datasource.username: ${OPENSHIFT\_MYSQL\_DB\_USERNAME} spring.datasource.password: ${OPENSHIFT\_MYSQL\_DB\_PASSWORD}

There’s a blog on [running Gradle in OpenShift](https://www.openshift.com/blogs/run-gradle-builds-on-openshift) on their website that will get you started with a gradle build to run the app.

## Amazon Web Services (AWS)

Amazon Web Services offers multiple ways to install Spring Boot based applications, either as traditional web applications (war) or as executable jar files with an embedded web server. Options include :

* AWS Elastic Beanstalk
* AWS Code Deploy
* AWS OPS Works
* AWS Cloud Formation
* AWS Container Registry

Each has different features and pricing model, here we will describe only the simplest option : AWS Elastic Beanstalk.

### AWS Elastic Beanstalk

As described in the official [Elastic Beanstalk Java guide](http://docs.aws.amazon.com/elasticbeanstalk/latest/dg/create_deploy_Java.html), there are two main options to deploy a Java application; You can either use the “Tomcat Platform” or the “Java SE platform”.

#### Using the Tomcat platform

This option applies to Spring Boot projects producing a war file. There is no any special configuration required, just follow the official guide.

#### Using the Java SE platform

This option applies to Spring Boot projects producing a jar file and running an embedded web container. Elastic Beanstalk environments run an nginx instance on port 80 to proxy the actual application, running on port 5000. To configure it, add the following to your application.properties:

server.port=5000

#### Best practices

**Uploading binaries instead of sources**

By default Elastic Beanstalk uploads sources and compiles them in AWS. To upload the binaries instead, add the following to your .elasticbeanstalk/config.yml file:

deploy:

artifact: target/demo-0.0.1-SNAPSHOT.jar

**Reduce costs by setting the environment type**

By default an Elastic Beanstalk environment is load balanced. The load balancer has a cost perspective, to avoid it, set the environment type to “Single instance” as described [in the Amazon documentation](http://docs.aws.amazon.com/elasticbeanstalk/latest/dg/environments-create-wizard.html#environments-create-wizard-capacity). Single instance environments can be created using the CLI as well using the following command:

eb create -s

### Summary

This is one of the easiest ways to get to AWS, but there are more things to cover, e.g.: how to integrate Elastic Beanstalk into any CI / CD tool, using the Elastic Beanstalk maven plugin instead of the CLI, etc. There is a [blog](https://exampledriven.wordpress.com/2017/01/09/spring-boot-aws-elastic-beanstalk-example/) covering these topics more in detail.

## Boxfuse and Amazon Web Services

[Boxfuse](https://boxfuse.com/) works by turning your Spring Boot executable jar or war into a minimal VM image that can be deployed unchanged either on VirtualBox or on AWS. Boxfuse comes with deep integration for Spring

Boot and will use the information from your Spring Boot configuration file to automatically configure ports and health check URLs. Boxfuse leverages this information both for the images it produces as well as for all the resources it provisions (instances, security groups, elastic load balancers, etc).

Once you have created a [Boxfuse account](https://console.boxfuse.com/), connected it to your AWS account, and installed the latest version of the Boxfuse Client, you can deploy your Spring Boot application to AWS as follows (ensure the application has been built by Maven or Gradle first using, for example, mvn clean package):

$ boxfuse run myapp-1.0.jar -env=prod

See the [boxfuse run documentation](https://boxfuse.com/docs/commandline/run.html) for more options. If there is a [boxfuse.com/docs/commandline/](https://boxfuse.com/docs/commandline/#configuration) [#configuration](https://boxfuse.com/docs/commandline/#configuration) [boxfuse.conf] file present in the current directory, it will be consulted.

**Tip**

By default Boxfuse will activate a Spring profile named boxfuse on startup and if your executable jar or war contains an [boxfuse.com/docs/payloads/springboot.html#configuration](https://boxfuse.com/docs/payloads/springboot.html#configuration) [application-boxfuse.properties] file, Boxfuse will base its configuration based on the properties it contains.

At this point boxfuse will create an image for your application, upload it, and then configure and start the necessary resources on AWS:

Fusing Image for myapp-1.0.jar ...

Image fused in 00:06.838s (53937 K) -> axelfontaine/myapp:1.0 Creating axelfontaine/myapp ...

Pushing axelfontaine/myapp:1.0 ... Verifying axelfontaine/myapp:1.0 ... Creating Elastic IP ...

Mapping myapp-axelfontaine.boxfuse.io to 52.28.233.167 ...

Waiting for AWS to create an AMI for axelfontaine/myapp:1.0 in eu-central-1 (this may take up to 50 seconds) ...

AMI created in 00:23.557s -> ami-d23f38cf

Creating security group boxfuse-sg\_axelfontaine/myapp:1.0 ...

Launching t2.micro instance of axelfontaine/myapp:1.0 (ami-d23f38cf) in eu-central-1 ... Instance launched in 00:30.306s -> i-92ef9f53

[Waiting for AWS to boot Instance i-92ef9f53 and Payload to start at http://52.28.235.61/](http://52.28.235.61/) ... Payload started in 00:29.266s -> <http://52.28.235.61/>

Remapping Elastic IP 52.28.233.167 to i-92ef9f53 ...

Waiting 15s for AWS to complete Elastic IP Zero Downtime transition ...

[Deployment completed successfully. axelfontaine/myapp:1.0 is up and running at http://myapp-](http://myapp-/) axelfontaine.boxfuse.io/

Your application should now be up and running on AWS.

There’s a blog on [deploying Spring Boot apps on EC2](https://boxfuse.com/blog/spring-boot-ec2.html) as well as [documentation for the Boxfuse Spring](https://boxfuse.com/docs/payloads/springboot.html) [Boot integration](https://boxfuse.com/docs/payloads/springboot.html) on their website that will get you started with a Maven build to run the app.

## Google Cloud

Google Cloud has several options that could be used to launch Spring Boot applications. The easiest to get started with is probably App Engine, but you could also find ways to run Spring Boot in a container with Container Engine, or on a virtual machine using Compute Engine.

To run in App Engine you can create a project in the UI first, which sets up a unique identifier for you and also HTTP routes. Add a Java app to the project and leave it empty, then use the [Google Cloud](https://cloud.google.com/sdk/downloads) [SDK](https://cloud.google.com/sdk/downloads) to push your Spring Boot app into that slot from the command line or CI build.

App Engine needs you to create an app.yaml file to describe the resources your app requires. Normally you put this in src/main/appengine, and it looks something like this:

**service**: default

**runtime**: java

**env**: flex

**runtime\_config**: **jdk**: openjdk8

**handlers**:

**- url**: /.\*

**script**: this field is required**,** but ignored

**manual\_scaling**: **instances**: 1

**health\_check**: **enable\_health\_check**: False

**env\_variables**:

**ENCRYPT\_KEY**: your\_encryption\_key\_here

You can deploy the app, for example, with a Maven plugin by simply adding the project ID to the build configuration:

**<plugin>**

**<groupId>**com.google.cloud.tools**</groupId>**

**<artifactId>**appengine-maven-plugin**</artifactId>**

**<version>**1.3.0**</version>**

**<configuration>**

**<project>**myproject**</project>**

**</configuration>**

**</plugin>**

Then deploy with mvn appengine:deploy (if you need to authenticate first the build will fail).

**Note**

Google App Engine Classic is tied to the Servlet 2.5 API, so you can’t deploy a Spring Application there without some modifications. See the [Servlet 2.5 section](#_bookmark567) of this guide.

# Installing Spring Boot applications

除了使用java -jar运行Spring Boot应用程序之外，还可以为Unix系统创建完全可执行的应用程序。 完全可执行的jar可以像任何其他可执行的二进制文件一样执行，也可以使用[registered with init.d or systemd](#_bookmark379)。 这使得在普通生产环境中安装和管理Spring Boot应用程序变得非常简单。

**Warning**

完全可执行的jar可以通过在文件的前面嵌入一个额外的脚本来工作。 目前，一些工具不接受这种格式，所以你可能无法一直使用这种技术。 例如，jar -xf可能默默无法提取已经被完全执行的jar或war。 建议如果您打算直接执行它，而不是使用java -jar或将其部署到servlet容器，那么您只能使jar或war完全可执行。

要用Maven创建一个‘fully executable”的jar，使用下面的插件配置：

**<plugin>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-maven-plugin**</artifactId>**

**<configuration>**

**<executable>**true**</executable>**

**</configuration>**

**</plugin>**

使用Gradle，等效的配置是：

springBoot {

executable = true

}

然后，您可以通过输入./my-application.jar（其中my-application是您的artifact的名称）运行您的应用程序。 包含该jar的目录将被用作应用程序的工作目录。

## 支持的操作系统(Supported operating systems)

默认脚本支持大多数Linux发行版，并在CentOS和Ubuntu上进行测试。 其他平台，比如OS X和FreeBSD，将需要使用定制的embeddedLaunchScript。

## Unix/Linux services

Spring Boot应用程序可以使用init.d或systemd轻松启动为Unix / Linux服务。

### 作为init.d服务安装(Installation as an init.d service (System V))

如果您已经配置了Spring Boot的Maven或Gradle插件来生成一个[fully executable jar](#_bookmark377)，并且您没有使用自定义embeddedLaunchScript，那么您的应用程序可以用作init.d服务。 将jar简单地链接到init.d，以支持标准的启动，停止，重新启动和状态命令。

该脚本支持以下功能：

* 以拥有该jar文件的用户身份启动服务
* 使用/var/run/<appname>/<appname>.pid跟踪应用程序的PID
* Writes console logs to /var/log/<appname>.log

假设您在/ var / myapp中安装了Spring Boot应用程序，要将Spring Boot应用程序安装为init.d服务，只需创建一个符号链接即可：

$ sudo ln -s /var/myapp/myapp.jar /etc/init.d/myapp

一旦安装，您可以按照通常的方式启动和停止服务。 例如，在基于Debian的系统上：

$ service myapp start

**Tip**

如果您的应用程序无法启动，请检查写入/var/log/<appname>.log的日志文件是否有错误。

您还可以将应用程序标记为使用标准操作系统工具自动启动。 例如，在Debian上：

$ update-rc.d myapp defaults <priority>

#### Securing an init.d service

**Note**

以下是关于如何保护作为init.d服务运行的Spring Boot应用程序的一组准则。 这并不是为了强化应用程序及其运行环境而应该做的所有事情的详尽清单。

当以root用户身份执行时，就像使用root启动init.d服务一样，默认的可执行脚本将以拥有jar文件的用户身份运行应用程序。 你永远不应该以root运行一个Spring Boot应用程序，所以你的应用程序的jar文件不应该被root所有。 相反，创建一个特定的用户来运行你的应用程序，并使用chown使其成为jar文件的所有者。 例如：

$ chown bootapp:bootapp your-app.jar

在这种情况下，默认的可执行脚本将作为bootapp用户运行应用程序。

**Tip**

为了减少应用程序用户帐户被攻破的可能性，您应该考虑防止它使用登录shell。 例如，将帐户的外壳设置为/ usr / sbin / nologin。

您还应该采取措施来防止修改应用程序的jar文件。 首先，配置它的权限，使其不能被写入，只能被其所有者读取或执行：

$ chmod 500 your-app.jar

其次，如果您的应用程序或运行该应用程序的帐户受到威胁，您还应该采取措施来限制损害。 如果攻击者获得访问权限，他们可以将jar文件写入并更改其内容。 防止这种情况的一种方法是使用chattr使其不可变：

$ sudo chattr +i your-app.jar

这将阻止任何用户（包括root）修改jar。

如果使用root来控制应用程序的服务，并使用[use a .conf file](#_bookmark386) 文件来定制其启动，那么.conf文件将被

root用户读取和评估。 它应该得到相应的保证。 使用chmod，以便文件只能被所有者读取，并使用

chown来使root拥有者：

$ chmod 400 your-app.conf

$ sudo chown root:root your-app.conf

### Installation as a systemd service

Systemd是System V init系统的继承者，现在已经被许多现代Linux发行版所使用。 尽管可以继续使用systemd的init.d脚本，但也可以使用systemd“‘service”脚本启动Spring Boot应用程序。

假设您在/ var / myapp中安装了Spring Boot应用程序，要将Spring Boot应用程序安装为systemd服务，请使用以下示例创建一个名为myapp.service的脚本，并将其放在/ etc / systemd / system目录中：

[Unit] Description=myapp After=syslog.target

[Service] User=myapp

ExecStart=/var/myapp/myapp.jar SuccessExitStatus=143

[Install]

WantedBy=multi-user.target

**Tip**

请记住更改应用程序的说明，用户和执行开始字段。

**Tip**

请注意，ExecStart字段不会声明脚本动作命令，这意味着运行命令是默认使用的。

请注意，与以init.d服务运行不同的是，运行应用程序，PID文件和控制台日志文件的用户由systemd本身管理，因此必须使用“service”脚本中的相应字段进行配置。 有关更多详细信息，请参阅服务单位配置手册页[service unit configuration man page](http://www.freedesktop.org/software/systemd/man/systemd.service.html) 。

要将应用程序标记为在系统引导时自动启动，请使用以下命令：

$ systemctl enable myapp.service

有关更多详细信息，请参阅man systemctl。

### 自定义 startup script

Maven或Gradle插件编写的默认嵌入式启动脚本可以通过多种方式进行自定义。 对于大多数人来说，使用默认脚本以及一些自定义是通常就够了。 如果您发现无法自定义您需要的内容，则可以始终使用embeddedLaunchScript选项来完全编写自己的文件。

#### Customizing script when it’s written

在写入jar文件时，定制启动脚本的元素通常是有意义的。 例如，init.d脚本可以提供一个“description”，因为你知道这个前面（而且不会改变），所以当你生成jar文件时，你也可以提供它。

要定制书写元素，请使用Spring Boot Maven或Gradle插件的embeddedLaunchScriptProperties选项。

默认脚本支持以下属性替换：

| **Name** | **Description** |
| --- | --- |
| mode | The script mode. Defaults to auto. |
| initInfoProvides | The Provides section of “INIT INFO”. Defaults to spring-boot-application for Gradle and to ${project.artifactId} for Maven. |
| initInfoRequiredStart | The Required-Start section of “INIT INFO”. Defaults to $remote\_fs $syslog $network. |
| initInfoRequiredStop | The Required-Stop section of “INIT INFO”. Defaults to $remote\_fs $syslog $network. |
| initInfoDefaultStart | The Default-Start section of “INIT INFO”. Defaults to 2 3 4 5. |
| initInfoDefaultStop | The Default-Stop section of “INIT INFO”. Defaults to 0 1 6. |
| initInfoShortDescription | The Short-Description section of “INIT INFO”. Defaults to Spring Boot Application for Gradle and to ${project.name} for Maven. |
| initInfoDescription | The Description section of “INIT INFO”. Defaults to Spring Boot Application for Gradle and to ${project.description}(falling back to ${project.name}) for Maven. |
| initInfoChkconfig | The chkconfig section of “INIT INFO”. Defaults to 2345 99 01. |
| confFolder | The default value for CONF\_FOLDER. Defaults to the folder containing the jar. |
| logFolder | The default value for LOG\_FOLDER. Only valid for an init.d service. |
| logFilename | The default value for LOG\_FILENAME. Only valid for an init.d service. |
| pidFolder | The default value for PID\_FOLDER. Only valid for an init.d service. |
| pidFilename | The default value for the name of the pid file in PID\_FOLDER. Only valid for an init.d service. |
| useStartStopDaemon | If the start-stop-daemon command, when it’s available, should be used to control the process. Defaults to true. |
| stopWaitTime | The default value for STOP\_WAIT\_TIME. Only valid for an init.d service. Defaults to 60 seconds. |

#### Customizing script when it runs

对于写入jar之后需要定制的脚本项目，可以使用环境变量或配置文件[config file](#_bookmark386)

For items of the script that need to be customized *after* the jar has been written you can use environment variables or a [config file](#_bookmark386).

默认脚本支持以下环境属性：

| **Variable** | **Description** |
| --- | --- |
| MODE | The “mode” of operation. The default depends on the way the jar was built, but will usually be auto *(meaning it tries to guess if it is an init script by checking if it is a symlink in a directory called init.d)*. You can explicitly set it to service so that the stop|start|status|restart commands work, or to run if you just want to run the script in the foreground. |
| USE\_START\_STOP\_DAEMON | If the start-stop-daemon command, when it’s available, should be used to control the process. Defaults to true. |
| PID\_FOLDER | The root name of the pid folder (/var/run by default). |
| LOG\_FOLDER | The name of the folder to put log files in (/var/log by default). |
| CONF\_FOLDER | The name of the folder to read .conf files from (same folder as jar-file by default). |
| LOG\_FILENAME | The name of the log file in the LOG\_FOLDER (<appname>.log by default). |
| APP\_NAME | The name of the app. If the jar is run from a symlink the script guesses the app name, but if it is not a symlink, or you want to explicitly set the app name this can be useful. |
| RUN\_ARGS | The arguments to pass to the program (the Spring Boot app). |
| JAVA\_HOME | The location of the java executable is discovered by using the PATH by default, but you can set it explicitly if there is an executable file at $JAVA\_HOME/bin/java. |
| JAVA\_OPTS | Options that are passed to the JVM when it is launched. |
| JARFILE | The explicit location of the jar file, in case the script is being used to launch a jar that it is not actually embedded in. |
| DEBUG | if not empty will set the -x flag on the shell process, making it easy to see the logic in the script. |
| STOP\_WAIT\_TIME | The time in seconds to wait when stopping the application before forcing a shutdown (60 by default). |

**Note**

PID\_FOLDER，LOG\_FOLDER和LOG\_FILENAME变量仅对init.d服务有效。 在systemd中，使用“service”脚本进行等效的自定义。 检查服务单位配置手册页[service unit configuration man page](http://www.freedesktop.org/software/systemd/man/systemd.service.html) 获取更多详细信息。

除了JARFILE和APP\_NAME之外，上述设置可以使用.conf文件进行配置。 该文件预计在jar文件旁边，并且具有相同的名称，但后缀为.conf而不是.jar。 例如，名为/var/myapp/myapp.jar的jar将使用名为/ var / myapp / myapp.conf的配置文件。

**myapp.conf.**

JAVA\_OPTS=-Xmx1024M

LOG\_FOLDER=/custom/log/folder

**Tip**

你可以使用CONF\_FOLDER环境变量来定制配置文件的位置，如果你不喜欢它居住在jar旁边的话。

要了解有关保护此文件的适当方法，请参阅保护init.d服务的指导原则[the guidelines for securing an init.d service](#_bookmark381)。

## Microsoft Windows services

Spring Boot应用程序可以使用[winsw](https://github.com/kohsuke/winsw)作为Windows服务启动。

分别维护Spring Boot核心的示例逐步介绍[maintained separately](https://github.com/snicoll-scratches/spring-boot-daemon) 了如何为Spring Boot应用程序创建Windows服务。

# What to read next

Check out the [Cloud Foundry](http://www.cloudfoundry.com/), [Heroku](https://www.heroku.com/), [OpenShift](https://www.openshift.com/) and [Boxfuse](https://boxfuse.com/) web sites for more information about the kinds of features that a PaaS can offer. These are just four of the most popular Java PaaS providers, since Spring Boot is so amenable to cloud-based deployment you’re free to consider other providers as well.

The next section goes on to cover the [*Spring Boot CLI*](#_bookmark389); or you can jump ahead to read about [*build*](#_bookmark407)[*tool plugins*](#_bookmark407).

**Part VII. Spring Boot CLI**

The Spring Boot CLI is a command line tool that can be used if you want to quickly develop with Spring. It allows you to run Groovy scripts, which means that you have a familiar Java-like syntax, without so much boilerplate code. You can also bootstrap a new project or write your own command for it.

# Installing the CLI

The Spring Boot CLI can be installed manually; using SDKMAN! (the SDK Manager) or using Homebrew or MacPorts if you are an OSX user. See [*Section 10.2, “Installing the Spring Boot CLI”*](#_bookmark16) in the “Getting started” section for comprehensive installation instructions.

# Using the CLI

Once you have installed the CLI you can run it by typing spring. If you run spring without any arguments, a simple help screen is displayed:

$ spring

usage: spring [--help] [--version]

<command> [<args>] Available commands are:

run [options] <files> [--] [args] Run a spring groovy script

*... more command help is shown here*

You can use help to get more details about any of the supported commands. For example:

$ spring help run

spring run - Run a spring groovy script

usage: spring run [options] <files> [--] [args] Option Description

------ -----------

--autoconfigure [Boolean] Add autoconfigure compiler

transformations (default: true)

--classpath, -cp Additional classpath entries

-e, --edit Open the file with the default system editor

--no-guess-dependencies Do not attempt to guess dependencies

--no-guess-imports Do not attempt to guess imports

-q, --quiet Quiet logging

-v, --verbose Verbose logging of dependency resolution

--watch Watch the specified file for changes

The version command provides a quick way to check which version of Spring Boot you are using.

$ spring version

Spring CLI v1.5.8.RELEASE

## Running applications using the CLI

You can compile and run Groovy source code using the run command. The Spring Boot CLI is completely self-contained so you don’t need any external Groovy installation.

Here is an example “hello world” web application written in Groovy:

**hello.groovy.**

@RestController

**class** WebApplication {

@RequestMapping("/") String home() {

***"Hello World!"***

}

}

To compile and run the application type:

$ spring run hello.groovy

To pass command line arguments to the application, you need to use a -- to separate them from the “spring” command arguments, e.g.

$ spring run hello.groovy -- --server.port=9000

To set JVM command line arguments you can use the JAVA\_OPTS environment variable, e.g.

$ JAVA\_OPTS=-Xmx1024m spring run hello.groovy

### Deduced “grab” dependencies

Standard Groovy includes a @Grab annotation which allows you to declare dependencies on a third- party libraries. This useful technique allows Groovy to download jars in the same way as Maven or Gradle would, but without requiring you to use a build tool.

Spring Boot extends this technique further, and will attempt to deduce which libraries to “grab” based on your code. For example, since the WebApplication code above uses @RestController annotations, “Tomcat” and “Spring MVC” will be grabbed.

The following items are used as “grab hints”:

|  |  |
| --- | --- |
| **Items** | **Grabs** |
| JdbcTemplate, NamedParameterJdbcTemplate, DataSource | JDBC Application. |
| @EnableJms | JMS Application. |
| @EnableCaching | Caching abstraction. |
| @Test  @EnableRabbit | JUnit.  RabbitMQ. |
| @EnableReactor | Project Reactor. |
| extends Specification | Spock test. |
| @EnableBatchProcessing | Spring Batch. |
| @MessageEndpoint @EnableIntegrationPatterns | Spring Integration. |
| @EnableDeviceResolver  @Controller @RestController @EnableWebMvc | Spring Mobile.  Spring MVC + Embedded Tomcat. |
| @EnableWebSecurity  @EnableTransactionManagement | Spring Security.  Spring Transaction Management. |

**Tip**

See subclasses of [CompilerAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-cli/src/main/java/org/springframework/boot/cli/compiler/CompilerAutoConfiguration.java) in the Spring Boot CLI source code to understand exactly how customizations are applied.

### Deduced “grab” coordinates

Spring Boot extends Groovy’s standard @Grab support by allowing you to specify a dependency without a group or version, for example @Grab('freemarker'). This will consult Spring Boot’s default dependency metadata to deduce the artifact’s group and version. Note that the default metadata is tied to the version of the CLI that you’re using – it will only change when you move to a new version of the CLI, putting you in control of when the versions of your dependencies may change. A table showing the dependencies and their versions that are included in the default metadata can be found in the [appendix](#_bookmark607).

### Default import statements

To help reduce the size of your Groovy code, several import statements are automatically included. Notice how the example above refers to @Component, @RestController and @RequestMapping without needing to use fully-qualified names or import statements.

**Tip**

Many Spring annotations will work without using import statements. Try running your application to see what fails before adding imports.

### Automatic main method

Unlike the equivalent Java application, you do not need to include a public static void main(String[] args) method with your Groovy scripts. A SpringApplication is automatically created, with your compiled code acting as the source.

### Custom dependency management

By default, the CLI uses the dependency management declared in spring-boot-dependencies when resolving @Grab dependencies. Additional dependency management, that will override the default dependency management, can be configured using the @DependencyManagementBom annotation. The annotation’s value should specify the coordinates (groupId:artifactId:version) of one or more Maven BOMs.

For example, the following declaration:

@DependencyManagementBom(***"com.example.custom-bom:1.0.0"***)

Will pick up custom-bom-1.0.0.pom in a Maven repository under com/example/custom- versions/1.0.0/.

When multiple BOMs are specified they are applied in the order that they’re declared. For example:

@DependencyManagementBom([***"com.example.custom-bom:1.0.0"***,

***"com.example.another-bom:1.0.0"***])

indicates that dependency management in another-bom will override the dependency management in custom-bom.

You can use @DependencyManagementBom anywhere that you can use @Grab, however, to ensure consistent ordering of the dependency management, you can only use @DependencyManagementBom at most once in your application. A useful source of dependency management (that is

a superset of Spring Boot’s dependency management) is the [Spring IO Platform](http://platform.spring.io/), e.g.

@DependencyManagementBom('io.spring.platform:platform-bom:1.1.2.RELEASE').

## Testing your code

The test command allows you to compile and run tests for your application. Typical usage looks like this:

$ spring test app.groovy tests.groovy Total: 1, Success: 1, : Failures: 0 Passed? true

In this example, tests.groovy contains JUnit @Test methods or Spock Specification classes. All the common framework annotations and static methods should be available to you without having to import them.

Here is the tests.groovy file that we used above (with a JUnit test):

**class** ApplicationTests {

@Test

**void** homeSaysHello() {

assertEquals(***"Hello World!"***, **new** WebApplication().home())

}

}

**Tip**

If you have more than one test source files, you might prefer to organize them into a test

directory.

## Applications with multiple source files

You can use “shell globbing” with all commands that accept file input. This allows you to easily use multiple files from a single directory, e.g.

$ spring run \*.groovy

This technique can also be useful if you want to segregate your “test” or “spec” code from the main application code:

$ spring test app/\*.groovy test/\*.groovy

## Packaging your application

You can use the jar command to package your application into a self-contained executable jar file. For example:

$ spring jar my-app.jar \*.groovy

The resulting jar will contain the classes produced by compiling the application and all of the application’s dependencies so that it can then be run using java -jar. The jar file will also contain entries from the application’s classpath. You can add explicit paths to the jar using --include and --exclude (both are comma-separated, and both accept prefixes to the values “+” and “-” to signify that they should be removed from the defaults). The default includes are

public/\*\*, resources/\*\*, static/\*\*, templates/\*\*, META-INF/\*\*, \*

and the default excludes are

.\*, repository/\*\*, build/\*\*, target/\*\*, \*\*/\*.jar, \*\*/\*.groovy

See the output of spring help jar for more information.

## Initialize a new project

The init command allows you to create a new project using [start.spring.io](https://start.spring.io/) without leaving the shell. For example:

$ spring init --dependencies=web,data-jpa my-project Using service at https://start.spring.io

Project extracted to '/Users/developer/example/my-project'

This creates a my-project directory with a Maven-based project using spring-boot-starter- web and spring-boot-starter-data-jpa. You can list the capabilities of the service using the -- list flag

$ spring init --list

=======================================

Capabilities of https://start.spring.io

=======================================

Available dependencies:

-----------------------

actuator - Actuator: Production ready features to help you monitor and manage your application

...

web - Web: Support for full-stack web development, including Tomcat and spring-webmvc websocket - Websocket: Support for WebSocket development

ws - WS: Support for Spring Web Services

Available project types:

------------------------

gradle-build - Gradle Config [format:build, build:gradle] gradle-project - Gradle Project [format:project, build:gradle] maven-build - Maven POM [format:build, build:maven]

maven-project - Maven Project [format:project, build:maven] (default)

...

The init command supports many options, check the help output for more details. For instance, the following command creates a gradle project using Java 8 and war packaging:

$ spring init --build=gradle --java-version=1.8 --dependencies=websocket --packaging=war sample-app.zip Using service at https://start.spring.io

Content saved to 'sample-app.zip'

## Using the embedded shell

Spring Boot includes command-line completion scripts for BASH and zsh shells. If you don’t use either of these shells (perhaps you are a Windows user) then you can use the shell command to launch an integrated shell.

$ spring shell

**Spring Boot** (v1.5.8.RELEASE)

Hit TAB to complete. Type \'help' and hit RETURN for help, and \'exit' to quit.

From inside the embedded shell you can run other commands directly:

$ version

Spring CLI v1.5.8.RELEASE

The embedded shell supports ANSI color output as well as tab completion. If you need to run a native command you can use the ! prefix. Hitting ctrl-c will exit the embedded shell.

## Adding extensions to the CLI

You can add extensions to the CLI using the install command. The command takes one or more sets of artifact coordinates in the format group:artifact:version. For example:

$ spring install com.example:spring-boot-cli-extension:1.0.0.RELEASE

In addition to installing the artifacts identified by the coordinates you supply, all of the artifacts' dependencies will also be installed.

To uninstall a dependency use the uninstall command. As with the install command, it takes one or more sets of artifact coordinates in the format group:artifact:version. For example:

$ spring uninstall com.example:spring-boot-cli-extension:1.0.0.RELEASE

It will uninstall the artifacts identified by the coordinates you supply and their dependencies. To uninstall all additional dependencies you can use the --all option. For example:

$ spring uninstall --all

# Developing application with the Groovy beans DSL

Spring Framework 4.0 has native support for a beans{} “DSL” (borrowed from [Grails](http://grails.org/)), and you can embed bean definitions in your Groovy application scripts using the same format. This is sometimes a good way to include external features like middleware declarations. For example:

@Configuration

**class** Application **implements** CommandLineRunner {

@Autowired SharedService service

@Override

**void** run(String... args) { println service.message

}

}

**import** my.company.SharedService beans {

service(SharedService) { message = ***"Hello World"***

}

}

You can mix class declarations with beans{} in the same file as long as they stay at the top level, or you can put the beans DSL in a separate file if you prefer.

# Configuring the CLI with settings.xml

The Spring Boot CLI uses Aether, Maven’s dependency resolution engine, to resolve dependencies. The CLI makes use of the Maven configuration found in ~/.m2/settings.xml to configure Aether. The following configuration settings are honored by the CLI:

* Offline
* Mirrors
* Servers
* Proxies
* Profiles
  + Activation
  + Repositories
* Active profiles

Please refer to [Maven’s settings documentation](https://maven.apache.org/settings.html) for further information.

# What to read next

There are some [sample groovy scripts](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-cli/samples) available from the GitHub repository that you can use to try out the Spring Boot CLI. There is also extensive Javadoc throughout the [source code](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-cli/src/main/java/org/springframework/boot/cli).

If you find that you reach the limit of the CLI tool, you will probably want to look at converting your application to full Gradle or Maven built “groovy project”. The next section covers Spring Boot’s [*Build*](#_bookmark407)[*tool plugins*](#_bookmark407) that you can use with Gradle or Maven.

**Part VIII. Build tool plugins**

Spring Boot provides build tool plugins for Maven and Gradle. The plugins offer a variety of features, including the packaging of executable jars. This section provides more details on both plugins, as well as some help should you need to extend an unsupported build system. If you are just getting started, you might want to read “[Chapter 13, *Build systems*](#_bookmark35)” from the [Part III, “Using Spring Boot”](#_bookmark34) section first.

# Spring Boot Maven plugin

[Spring Boot Maven Plugin](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/maven-plugin/)在Maven中提供了Spring Boot支持，允许你打包可执行的jar或war档案并运行一个应用程序“in-place”。 要使用它，你必须使用Maven 3.2（或更高版本）。

**Note**

有关完整的插件文档，请参阅[Spring Boot Maven Plugin Site](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/maven-plugin/) 站点。

## Including the plugin

要使用Spring Boot Maven Plugin，只需在pom.xml的插件部分包含适当的XML

<?xml version="1.0" encoding="UTF-8"?>

**<project xmlns**=[**"http://maven.apache.org/POM/4.0.0"**](http://maven.apache.org/POM/4.0.0) **xmlns:xsi**=[**"http://www.w3.org/2001/XMLSchema-instance"**](http://www.w3.org/2001/XMLSchema-instance) **xsi:schemaLocation**=[**"http://maven.apache.org/POM/4.0.0**](http://maven.apache.org/POM/4.0.0)[**http://maven.apache.org/xsd/maven-4.0.0.xsd"**](http://maven.apache.org/xsd/maven-4.0.0.xsd)**>**

**<modelVersion>**4.0.0**</modelVersion>**

*<!-- ... -->*

**<build>**

**<plugins>**

**<plugin>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-maven-plugin**</artifactId>**

**<version>**1.5.8.RELEASE**</version>**

**<executions>**

**<execution>**

**<goals>**

**<goal>**repackage**</goal>**

**</goals>**

**</execution>**

**</executions>**

**</plugin>**

**</plugins>**

**</build>**

**</project>**

这个配置将重新包装一个在Maven生命周期的包装阶段生成的jar或war。 以下示例显示目标目录中的重新打包的jar以及原始jar：

$ mvn package

$ ls target/\*.jar

target/myproject-1.0.0.jar target/myproject-1.0.0.jar.original

如果你不包括上面的<execution />配置，你可以自己运行插件（但是只有在使用包目标的时候）。 例如：

$ mvn package spring-boot:repackage

$ ls target/\*.jar

target/myproject-1.0.0.jar target/myproject-1.0.0.jar.original

如果您正在使用里程碑(milestone)或快照(snapshot)版本，则还需要添加适当的pluginRepository元素：

**<pluginRepositories>**

**<pluginRepository>**

**<id>**spring-snapshots**</id>**

**<url>**<http://repo.spring.io/snapshot>**</url>**

**</pluginRepository>**

**<pluginRepository>**

**<id>**spring-milestones**</id>**

**<url>**<http://repo.spring.io/milestone>**</url>**

**</pluginRepository>**

**</pluginRepositories>**

## Packaging executable jar and war files

一旦spring-boot-maven-plugin包含在你的pom.xml文件中，它就会自动尝试使用spring-boot：repackage目标来重写归档文件。 你应该配置你的项目使用通常的包装元素来构建一个jar或war（适当的时候）：

<?xml version="1.0" encoding="UTF-8"?>

**<project xmlns**=[**"http://maven.apache.org/POM/4.0.0"**](http://maven.apache.org/POM/4.0.0) **xmlns:xsi**=[**"http://www.w3.org/2001/XMLSchema-instance"**](http://www.w3.org/2001/XMLSchema-instance) **xsi:schemaLocation**=[**"http://maven.apache.org/POM/4.0.0**](http://maven.apache.org/POM/4.0.0)[**http://maven.apache.org/xsd/maven-4.0.0.xsd"**](http://maven.apache.org/xsd/maven-4.0.0.xsd)**>**

*<!-- ... -->*

**<packaging>**jar**</packaging>**

*<!-- ... -->*

**</project>**

在打包(package)阶段，您的现有存档将被Spring Boot增强。 要启动的主类可以使用配置选项指定，也可以通过以常用方式向清单中添加Main-Class属性来指定。 如果你不指定一个主类，插件将使用public static void main（String [] args）方法搜索一个类。

要构建和运行项目工件，可以键入以下内容：

$ mvn package

$ java -jar target/mymodule-0.0.1-SNAPSHOT.jar

要构建可执行文件并将其部署到外部容器中，需要将嵌入容器依赖项标记为“provided”，例如：

<?xml version="1.0" encoding="UTF-8"?>

**<project xmlns**=[**"http://maven.apache.org/POM/4.0.0"**](http://maven.apache.org/POM/4.0.0) **xmlns:xsi**=[**"http://www.w3.org/2001/XMLSchema-instance"**](http://www.w3.org/2001/XMLSchema-instance) **xsi:schemaLocation**=[**"http://maven.apache.org/POM/4.0.0**](http://maven.apache.org/POM/4.0.0)[**http://maven.apache.org/xsd/maven-4.0.0.xsd"**](http://maven.apache.org/xsd/maven-4.0.0.xsd)**>**

*<!-- ... -->*

**<packaging>**war**</packaging>**

*<!-- ... -->*

**<dependencies>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-web**</artifactId>**

**</dependency>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-tomcat**</artifactId>**

**<scope>**provided**</scope>**

**</dependency>**

*<!-- ... -->*

**</dependencies>**

**</project>**

**Tip**

有关如何创建可部署的war文件的更多详细信息，请参阅““[Section 85.1, “Create a deployable war file”](#_bookmark563)”部分。

高级配置选项和示例可在插件信息页面([plugin info page](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/maven-plugin/))中找到。

# Spring Boot Gradle plugin

The Spring Boot Gradle Plugin provides Spring Boot support in Gradle, allowing you to package executable jar or war archives, run Spring Boot applications and use the dependency management provided by spring-boot-dependencies.

## Including the plugin

To use the Spring Boot Gradle Plugin configure it using the plugins block:

plugins {

id ***'org.springframework.boot'*** version ***'1.5.8.RELEASE'***

}

## Gradle dependency management

The spring-boot plugin automatically applies the [Dependency Management Plugin](https://github.com/spring-gradle-plugins/dependency-management-plugin/) and configures it to import the spring-boot-starter-parent bom. This provides a similar dependency management experience to the one that is enjoyed by Maven users. For example, it allows you to omit version numbers when declaring dependencies that are managed in the bom. To make use of this functionality, simply declare dependencies in the usual way, but leave the version number empty:

dependencies {

compile(***"org.springframework.boot:spring-boot-starter-web"***) compile(***"org.thymeleaf:thymeleaf-spring4"***) compile(***"nz.net.ultraq.thymeleaf:thymeleaf-layout-dialect"***)

}

**Note**

The version of the spring-boot gradle plugin that you declare determines the version of the spring-boot-starter-parent bom that is imported (this ensures that builds are always repeatable). You should always set the version of the spring-boot gradle plugin to the actual Spring Boot version that you wish to use. Details of the versions that are provided can be found in the [appendix](#_bookmark607).

To learn more about the capabilities of the Dependency Management Plugin, please refer to its [documentation](https://github.com/spring-gradle-plugins/dependency-management-plugin/blob/master/README.md).

## Packaging executable jar and war files

Once the spring-boot plugin has been applied to your project it will automatically attempt to rewrite archives to make them executable using the [bootRepackage task](#_bookmark417). You should configure your project to build a jar or war (as appropriate) in the usual way.

The main class that you want to launch can either be specified using a configuration option, or by adding a Main-Class attribute to the manifest. If you don’t specify a main class the plugin will search for a class with a public static void main(String[] args) method.

**Tip**

Check [Section 67.6, “Repackage configuration”](#_bookmark417) for a full list of configuration options.

To build and run a project artifact, you can type the following:

$ gradle build

$ java -jar build/libs/mymodule-0.0.1-SNAPSHOT.jar

To build a war file that is both executable and deployable into an external container, you need to mark the embedded container dependencies as belonging to the war plugin’s providedRuntime configuration, e.g.:

...

apply plugin: ***'war'***

war {

baseName = ***'myapp'***

version = ***'0.5.0'***

}

repositories { jcenter()

maven { url [***"http://repo.spring.io/libs-snapshot"***](http://repo.spring.io/libs-snapshot) }

}

dependencies {

compile(***"org.springframework.boot:spring-boot-starter-web"***) providedRuntime(***"org.springframework.boot:spring-boot-starter-tomcat"***)

...

}

**Tip**

See the “[Section 85.1, “Create a deployable war file”](#_bookmark563)” section for more details on how to create a deployable war file.

## Running a project in-place

To run a project in place without building a jar first you can use the “bootRun” task:

$ gradle bootRun

If [devtools](#_bookmark67) has been added to your project it will automatically monitor your application for changes. Alternatively, you can also run the application so that your static classpath resources (i.e. in src/main/ resources by default) are reloadable in the live application, which can be helpful at development time.

bootRun {

addResources = true

}

Making static classpath resources reloadable means that bootRun does not use the output of the processResources task, i.e., when invoked using bootRun, your application will use the resources in their unprocessed form.

## Spring Boot plugin configuration

The gradle plugin automatically extends your build script DSL with a springBoot element for global configuration of the Boot plugin. Set the appropriate properties as you would with any other Gradle extension (see below for a list of configuration options):

springBoot {

backupSource = false

}

## Repackage configuration

The plugin adds a bootRepackage task which you can also configure directly, e.g.:

bootRepackage {

mainClass = ***'demo.Application'***

}

The following configuration options are available:

|  |  |
| --- | --- |
| **Name** | **Description** |
| enabled  mainClass | Boolean flag to switch the repackager off (sometimes useful if you want the other Boot features but not this one)  The main class that should be run. If not specified, and you have applied the application plugin, the mainClassName project property will be used. If the application plugin has not been applied or no mainClassName has been specified, the archive will be searched for a suitable class. "Suitable" means a unique class with a well-formed main() method (if more than one is found the build will fail). If you have applied the application plugin, the main class can also be specified via its "run" task (main property) and/or its "startScripts" task (mainClassName property) as an alternative to using the "springBoot" configuration. |
| classifier | A file name segment (before the extension) to add to the archive, so that the original is preserved in its original location. Defaults to null in which case the archive is repackaged in place. The default is convenient for many purposes, but if you want to use  the original jar as a dependency in another project you must use a classifier to define the executable archive. |
| withJarTask | The name or value of the Jar task (defaults to all tasks of type  Jar) which is used to locate the archive to repackage. |
| customConfiguration  executable | The name of the custom configuration which is used to populate the nested lib directory (without specifying this you get all compile and runtime dependencies).  Boolean flag to indicate if jar files are fully executable on Unix like operating systems. Defaults to false. |
| embeddedLaunchScript  embeddedLaunchScriptProp | The embedded launch script to prepend to the front of the jar if it is fully executable. If not specified the 'Spring Boot' default script will be used.  erAtdideitisonal properties that to be expanded in the launch script. The default script supports a mode property which can contain the values auto, service or run. |
| excludeDevtools | Boolean flag to indicate if the devtools jar should be excluded from the repackaged archives. Defaults to true. |

## Repackage with custom Gradle configuration

Sometimes it may be more appropriate to not package default dependencies resolved from compile, runtime and provided scopes. If the created executable jar file is intended to be run as it is, you need to have all dependencies nested inside it; however, if the plan is to explode a jar file and run the main class manually, you may already have some of the libraries available via CLASSPATH. This is a situation where you can repackage your jar with a different set of dependencies.

Using a custom configuration will automatically disable dependency resolving from compile, runtime and provided scopes. Custom configuration can be either defined globally (inside the springBoot section) or per task.

task clientJar(type: Jar) { appendix = ***'client'***

from sourceSets.main.output exclude(***'\*\*/\*Something\*'***)

}

task clientBoot(type: BootRepackage, dependsOn: clientJar) { withJarTask = clientJar

customConfiguration = ***"mycustomconfiguration"***

}

In above example, we created a new clientJar Jar task to package a customized file set from your compiled sources. Then we created a new clientBoot BootRepackage task and instructed it to work with only clientJar task and mycustomconfiguration.

configurations {

mycustomconfiguration.exclude group: ***'log4j'***

}

dependencies {

mycustomconfiguration configurations.runtime

}

The configuration that we are referring to in BootRepackage is a normal [Gradle configuration](https://docs.gradle.org/2.14.1/dsl/org.gradle.api.artifacts.Configuration.html). In the above example we created a new configuration named mycustomconfiguration instructing it to derive from a runtime and exclude the log4j group. If the clientBoot task is executed, the repackaged boot jar will have all dependencies from runtime but no log4j jars.

### Configuration options

The following configuration options are available:

|  |  |
| --- | --- |
| **Name**  mainClass | **Description**  The main class that should be run by the executable archive. |
| providedConfiguration  backupSource | The name of the provided configuration (defaults to  providedRuntime).  If the original source archive should be backed-up before being repackaged (defaults to true). |
| customConfiguration layout | The name of the custom configuration.  The type of archive, corresponding to how the dependencies are laid out inside (defaults to a guess based on the archive type).  See [available layouts for more details](#_bookmark420). |

|  |  |
| --- | --- |
| **Name** | **Description** |
| layoutFactory  requiresUnpack | A layout factory that can be used if a custom layout is required. Alternative layouts can be provided by 3rd parties. Layout factories are only used when layout is not specified.  A list of dependencies (in the form “groupId:artifactId” that must be unpacked from fat jars in order to run. Items are still packaged into the fat jar, but they will be automatically unpacked when it runs. |

### Available layouts

The layout attribute configures the format of the archive and whether the bootstrap loader should be included or not. The following layouts are available:

|  |  |  |
| --- | --- | --- |
| **Name**  JAR | **Description**  Regular executable [JAR layout](#_bookmark595). | **Executable**  Yes |
| WAR | Executable [WAR layout](#_bookmark596). provided dependencies are placed in WEB-INF/lib-provided to avoid any clash when the war is deployed in a servlet container. | Yes |
| ZIP (alias to DIR) MODULE | Similar to JAR layout, using [PropertiesLauncher](#_bookmark602).  Bundle dependencies (excluding those with provided  scope) and project resources. | Yes No |
| NONE | Bundle all dependencies and project resources. | No |

### Using a custom layout

If you have custom requirements for how to arrange the dependencies and loader classes inside the repackaged jar, you can use a custom layout. Any library which defines one or more LayoutFactory implementations can be added to the build script dependencies and then the layout factory becomes available in the springBoot configuration. For example:

buildscript { repositories {

mavenCentral()

}

dependencies {

classpath(***"org.springframework.boot:spring-boot-gradle-plugin:1.5.8.RELEASE"***) classpath(***"com.example:custom-layout:1.0.0"***)

}

}

springBoot {

layoutFactory = **new** com.example.CustomLayoutFactory()

}

**Note**

If there is only one custom LayoutFactory on the build classpath and it is listed in META-INF/ spring.factories then it is unnecessary to explicitly set it in the springBoot configuration. Layout factories are only used when no explicit layout is specified.

## Understanding how the Gradle plugin works

When spring-boot is applied to your Gradle project a default task named bootRepackage is created automatically. The bootRepackage task depends on Gradle assemble task, and when executed, it tries to find all jar artifacts whose qualifier is empty (i.e. tests and sources jars are automatically skipped).

Due to the fact that bootRepackage finds 'all' created jar artifacts, the order of Gradle task execution is important. Most projects only create a single jar file, so usually this is not an issue; however, if you are planning to create a more complex project setup, with custom Jar and BootRepackage tasks, there are few tweaks to consider.

If you are 'just' creating custom jar files from your project you can simply disable default jar and

bootRepackage tasks:

jar.enabled = false bootRepackage.enabled = false

Another option is to instruct the default bootRepackage task to only work with a default jar task.

bootRepackage.withJarTask = jar

If you have a default project setup where the main jar file is created and repackaged, 'and' you still want to create additional custom jars, you can combine your custom repackage tasks together and use dependsOn so that the bootJars task will run after the default bootRepackage task is executed:

task bootJars

bootJars.dependsOn = [clientBoot1,clientBoot2,clientBoot3] build.dependsOn(bootJars)

All the above tweaks are usually used to avoid situations where an already created boot jar is repackaged again. Repackaging an existing boot jar will not break anything, but you may find that it includes unnecessary dependencies.

## Publishing artifacts to a Maven repository using Gradle

If you are declaring dependencies without versions and you want to publish artifacts to a Maven repository you will need to configure the Maven publication with details of Spring Boot’s dependency management. This can be achieved by configuring it to publish poms that inherit from spring-boot- starter-parent or that import dependency management from spring-boot-dependencies. The exact details of this configuration depend on how you’re using Gradle and how you’re trying to publish the artifacts.

### Configuring Gradle to produce a pom that inherits dependency management

The following is an example of configuring Gradle to generate a pom that inherits from spring-boot- starter-parent. Please refer to the [Gradle User Guide](https://docs.gradle.org/2.14.1/userguide/userguide.html) for further information.

uploadArchives { repositories {

mavenDeployer { pom {

project {

parent {

groupId ***"org.springframework.boot"***

artifactId ***"spring-boot-starter-parent"***

version ***"1.5.8.RELEASE"***

}

}

}

}

}

}

### Configuring Gradle to produce a pom that imports dependency management

The following is an example of configuring Gradle to generate a pom that imports the dependency management provided by spring-boot-dependencies. Please refer to the [Gradle User Guide](http://www.gradle.org/docs/current/userguide/userguide.html) for further information.

uploadArchives { repositories {

mavenDeployer { pom {

project {

dependencyManagement { dependencies {

dependency {

groupId ***"org.springframework.boot"*** artifactId ***"spring-boot-dependencies"*** version ***"1.5.8.RELEASE"***

type ***"pom"***

scope ***"import"***

}

}

}

}

}

}

}

}

# Spring Boot AntLib module

The Spring Boot AntLib module provides basic Spring Boot support for Apache Ant. You can use the module to create executable jars. To use the module you need to declare an additional spring-boot namespace in your build.xml:

**<project xmlns:ivy**=**"antlib:org.apache.ivy.ant" xmlns:spring-boot**=**"antlib:org.springframework.boot.ant" name**=**"myapp" default**=**"build">**

...

**</project>**

You’ll need to remember to start Ant using the -lib option, for example:

$ ant -lib <folder containing spring-boot-antlib-1.5.8.RELEASE.jar>

**Tip**

The “Using Spring Boot” section includes a more complete example of [using Apache Ant with](#_bookmark43)

[spring-boot-antlib](#_bookmark43)

## Spring Boot Ant tasks

Once the spring-boot-antlib namespace has been declared, the following additional tasks are available.

### spring-boot:exejar

The exejar task can be used to creates a Spring Boot executable jar. The following attributes are supported by the task:

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Description** | **Required** |
| destfile | The destination jar file to create | Yes |
| classes start-class | The root directory of Java class files The main application class to run | Yes  No *(default is first class found declaring a main method)* |

The following nested elements can be used with the task:

|  |
| --- |
| **Element Description** |
| resources One or more [Resource Collections](http://ant.apache.org/manual/Types/resources.html#collection) describing a set of [Resources](http://ant.apache.org/manual/Types/resources.html) that should be added to the content of the created jar file.  lib One or more [Resource Collections](http://ant.apache.org/manual/Types/resources.html#collection) that should be added to the set of jar libraries that make up the runtime dependency classpath of the application. |

### Examples

**Specify start-class.**

**<spring-boot:exejar destfile**=**"target/my-application.jar" classes**=**"target/classes" start-class**=**"com.foo.MyApplication">**

**<resources>**

**<fileset dir**=**"src/main/resources" />**

**</resources>**

**<lib>**

**<fileset dir**=**"lib" />**

**</lib>**

**</spring-boot:exejar>**

**Detect start-class.**

**<exejar destfile**=**"target/my-application.jar" classes**=**"target/classes">**

**<lib>**

**<fileset dir**=**"lib" />**

**</lib>**

**</exejar>**

## spring-boot:findmainclass

The findmainclass task is used internally by exejar to locate a class declaring a main. You can also use this task directly in your build if needed. The following attributes are supported

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Description** | **Required** |
| classesroot | The root directory of Java class files | Yes *(unless mainclass is specified)* |
| mainclass | Can be used to short-circuit the main | No |
|  | class search |  |
| property | The Ant property that should be set | No *(result will be logged if unspecified)* |
|  | with the result |  |

### Examples

**Find and log.**

**<findmainclass classesroot**=**"target/classes" />**

**Find and set.**

**<findmainclass classesroot**=**"target/classes" property**=**"main-class" />**

**Override and set.**

**<findmainclass mainclass**=**"com.foo.MainClass" property**=**"main-class" />**

# Supporting other build systems

If you want to use a build tool other than Maven, Gradle or Ant, you will likely need to develop your own plugin. Executable jars need to follow a specific format and certain entries need to be written in an uncompressed form (see the [*executable jar format*](#_bookmark593) section in the appendix for details).

The Spring Boot Maven and Gradle plugins both make use of spring-boot-loader-tools to actually generate jars. You are also free to use this library directly yourself if you need to.

## Repackaging archives

To repackage an existing archive so that it becomes a self-contained executable archive use org.springframework.boot.loader.tools.Repackager. The Repackager class takes a single constructor argument that refers to an existing jar or war archive. Use one of the two available repackage() methods to either replace the original file or write to a new destination. Various settings can also be configured on the repackager before it is run.

## Nested libraries

When repackaging an archive you can include references to dependency files using the org.springframework.boot.loader.tools.Libraries interface. We don’t provide any concrete implementations of Libraries here as they are usually build system specific.

If your archive already includes libraries you can use Libraries.NONE.

## Finding a main class

If you don’t use Repackager.setMainClass() to specify a main class, the repackager will use [ASM](http://asm.ow2.org/) to read class files and attempt to find a suitable class with a public static void main(String[] args) method. An exception is thrown if more than one candidate is found.

## Example repackage implementation

Here is a typical example repackage:

Repackager repackager = **new** Repackager(sourceJarFile); repackager.setBackupSource(false); repackager.repackage(**new** Libraries() {

@Override

**public void** doWithLibraries(LibraryCallback callback) **throws** IOException {

*// Build system specific implementation, callback for each dependency*

*// callback.library(new Library(nestedFile, LibraryScope.COMPILE));*

}

});

# What to read next

If you’re interested in how the build tool plugins work you can look at the [spring-boot-tools](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-tools) module on GitHub. More technical details of the [executable jar format](#_bookmark593) are covered in the appendix.

If you have specific build-related questions you can check out the “[how-to](#_bookmark438)” guides.

**Part IX. ‘How-to’ guides**

This section provides answers to some common ‘how do I do that…’ type of questions that often arise when using Spring Boot. This is by no means an exhaustive list, but it does cover quite a lot.

If you are having a specific problem that we don’t cover here, you might want to check out [stackoverflow.com](http://stackoverflow.com/tags/spring-boot) to see if someone has already provided an answer; this is also a great place to ask new questions (please use the spring-boot tag).

We’re also more than happy to extend this section; If you want to add a ‘how-to’ you can send us a [pull request](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE).

# Spring Boot application

## 创建你自己的 FailureAnalyzer

[FailureAnalyzer](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/diagnostics/FailureAnalyzer.html) 是在启动时拦截异常并将其转换为可读的消息并包装到[FailureAnalysis](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/diagnostics/FailureAnalysis.html)中的好方法。 Spring Boot为应用程序上下文相关异常，JSR-303验证等提供了这样的分析器。 创建你自己的实际上是非常容易的。

AbstractFailureAnalyzer是FailureAnalyzer的一个方便的扩展，它检查异常中是否存在指定的异常类型。 你可以扩展它，这样你的实现只有在实际存在时才有机会处理这个异常。 如果由于某种原因你不能处理异常，则返回null给另一个实现一个处理异常的机会。

FailureAnalyzer实现将在META-INF / spring.factories中注册：以下注册ProjectConstraintViolationFailureAnalyzer：

**org.springframework.boot.diagnostics.FailureAnalyzer**=\ com.example.ProjectConstraintViolationFailureAnalyzer

## auto-configuration 疑难解答(Troubleshoot auto-configuration)

Spring Boot自动配置尽最大努力去做“do the right thing”，但有时候事情会失败，很难说清原因。

在任何Spring Boot ApplicationContext中都有一个非常有用的ConditionEvaluationReport。 你会看到它，如果你启用DEBUG日志输出。 如果您使用spring-boot-actuator，那么还有一个自动配置端点以JSON呈现报表。 使用它来调试应用程序，看看Spring Boot在运行时添加了哪些功能（哪些功能没有添加）。

通过查看源代码和Javadoc，可以回答更多的问题。 一些经验法则：

* 查找称为\* AutoConfiguration的类，并阅读它们的源代码，特别是@ Conditional \*注释，以找出它们启用的功能以及何时启用的功能。 Add --debug到命令行或系统属性-Ddebug获取在您的应用程序中所做的所有自动配置决策的控制台日志。 在一个正在运行的Actuator应用程序中查看autoconfig端点（'/ autoconfig'或JMX等价物）以获取相同的信息。
* 查找@ConfigurationProperties类（例如[ServerProperties](https://github.com/spring-projects/spring-boot/blob/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/ServerProperties.java)）并从那里读取可用的外部配置选项。 @ConfigurationProperties有一个名称属性作为外部属性的前缀，因此ServerProperties有prefix =“server”，它的配置属性是server.port，server.address等。在一个正在运行的Actuator应用程序中查看configprops端点。
* 查找使用RelaxedPropertyResolver将配置值明确地从环境中提取出来。它通常与前缀一起使用
* 查找直接绑定到环境的@Value注解。这不如RelaxedPropertyResolver方法灵活，但是允许一些放松的绑定，特别是OS环境变量(所以CAPITALS\_AND\_UNDERSCORES是period.separated的同义词)。
* 查找@ConditionalOnExpression注释，用于响应SpEL表达式开启和关闭功能，通常使用从环境中解析的占位符进行评估。

## 在开始之前自定义Environment或Application

SpringApplication具有ApplicationListeners和ApplicationContextInitializers，用于将自定义应用于上下文或环境。 Spring Boot从META-INF / spring.factories中加载了许多这样的自定义内部使用。 有多种方法可以注册更多的：

* 在运行之前，通过调用SpringApplication上的addListeners和addInitializers方法为每个应用程序编程。
* 声明的每个应用程序通过设置context.initializer.classes或context.listener.classes
* 通过添加META-INF / spring.factories并打包应用程序都用作库的jar文件，为所有应用程序声明性地进行声明。

SpringApplication将一些特殊的ApplicationEvents发送到监听器（甚至在创建上下文之前），然后为ApplicationContext发布的事件注册监听器。 有关完整列表，请参见[*Section 23.5, “Application events and listeners”*](#_bookmark91) 应用程序事件和侦听器”。

在使用EnvironmentPostProcessor刷新应用程序上下文之前，也可以定制环境。 每个实现应该在META-INF / spring.factories中注册：

**org.springframework.boot.env.EnvironmentPostProcessor**=com.example.YourEnvironmentPostProcessor

该实现可以加载任意文件并将其添加到环境中。 例如，这个例子从类路径中加载一个YAML配置文件：

**public class** EnvironmentPostProcessorExample **implements** EnvironmentPostProcessor {

**private final** YamlPropertySourceLoader loader = **new** YamlPropertySourceLoader(); @Override

**public void** postProcessEnvironment(ConfigurableEnvironment environment, SpringApplication application) {

Resource path = **new** ClassPathResource(***"com/example/myapp/config.yml"***); PropertySource<?> propertySource = loadYaml(path); environment.getPropertySources().addLast(propertySource);

}

**private** PropertySource<?> loadYaml(Resource path) {

**if** (!path.exists()) {

**throw new** IllegalArgumentException(***"Resource "*** + path + ***" does not exist"***);

}

**try** {

**return this**.loader.load(***"custom-resource"***, path, null);

}

**catch** (IOException ex) {

**throw new** IllegalStateException(

***"Failed to load yaml configuration from "*** + path, ex);

}

}

}

**Tip**

环境已经准备好了Spring Boot默认加载的所有常用属性资源。 因此可以从环境中获取文件的位置。 此示例在列表的末尾添加自定义资源属性源，以便在任何常用其他位置定义的键优先。 自定义实现可能显然定义了另一个订(order)。

**Note**

在@SpringBootApplication上使用@PropertySource看起来既方便又简单，可以在环境中加载自定义资源，我们不建议这样做，因为在BootContext刷新之前，Spring Boot会准备环境。 任何通过@PropertySource定义的键都会被加载太迟而不能对自动配置产生任何影响。

## 构建一个ApplicationContext层次结构(添加parent或root context)

您可以使用ApplicationBuilder类创建parent/child ApplicationContext层次结构。 有关更多信息，请参见[*Section 23.4, “Fluent builder API”*](#_bookmark90)。

## 创建一个非Web应用程序

并非所有的Spring应用程序都必须是Web应用程序（或Web服务）。 如果你想在主要方法中执行一些代码，而且还要引导一个Spring应用程序来设置要使用的基础结构，那么使用Spring Boot的SpringApplication功能很容易。 SpringApplication根据是否认为需要Web应用程序来更改它的ApplicationContext类。 您可以做的第一件事就是将servlet API依赖关系从类路径中移除。 如果你不能这样做（例如，你从同一个代码库运行2个应用程序），那么你可以显式地在你的SpringApplication实例上调用setWebEnvironment（false），或者设置applicationContextClass属性（通过Java API或者外部属性）。 要作为业务逻辑运行的应用程序代码可以作为CommandLineRunner实现，并以@Bean定义的形式放入上下文中。

# Properties & configuration

## Automatically expand properties at build time

Rather than hardcoding some properties that are also specified in your project’s build configuration, you can automatically expand them using the existing build configuration instead. This is possible in both Maven and Gradle.

### Automatic property expansion using Maven

You can automatically expand properties from the Maven project using resource filtering. If you use the spring-boot-starter-parent you can then refer to your Maven ‘project properties’ via @..@ placeholders, e.g.

[**app.encoding**=@project.build.sourceEncoding@](mailto:app.encoding%3D@project.build.sourceEncoding@) [**app.java.version**=@java.version@](mailto:app.java.version%3D@java.version@)

**Note**

Only production configuration is filtered that way (i.e. no filtering is applied on src/test/ resources).

**Tip**

The spring-boot:run can add src/main/resources directly to the classpath (for hot reloading purposes) if you enable the addResources flag. This circumvents the resource filtering and this feature. You can use the exec:java goal instead or customize the plugin’s configuration, see the [plugin usage page](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/maven-plugin/usage.html) for more details.

If you don’t use the starter parent, in your pom.xml you need (inside the <build/> element):

**<resources>**

**<resource>**

**<directory>**src/main/resources**</directory>**

**<filtering>**true**</filtering>**

**</resource>**

**</resources>**

and (inside <plugins/>):

**<plugin>**

**<groupId>**org.apache.maven.plugins**</groupId>**

**<artifactId>**maven-resources-plugin**</artifactId>**

**<version>**2.7**</version>**

**<configuration>**

**<delimiters>**

**<delimiter>**@**</delimiter>**

**</delimiters>**

**<useDefaultDelimiters>**false**</useDefaultDelimiters>**

**</configuration>**

**</plugin>**

**Note**

The useDefaultDelimiters property is important if you are using standard Spring placeholders in your configuration (e.g. ${foo}). These may be expanded by the build if that property is not set to false.

### Automatic property expansion using Gradle

You can automatically expand properties from the Gradle project by configuring the Java plugin’s

processResources task to do so:

processResources { expand(project.properties)

}

You can then refer to your Gradle project’s properties via placeholders, e.g.

**app.name**=${name} **app.description**=${description}

**Note**

Gradle’s expand method uses Groovy’s SimpleTemplateEngine which transforms ${..} tokens. The ${..} style conflicts with Spring’s own property placeholder mechanism. To use Spring property placeholders together with automatic expansion the Spring property placeholders need to be escaped like \${..}.

## Externalize the configuration of SpringApplication

A SpringApplication has bean properties (mainly setters) so you can use its Java API as you create the application to modify its behavior. Or you can externalize the configuration using properties in spring.main.\*. E.g. in application.properties you might have.

**spring.main.web-environment**=false **spring.main.banner-mode**=off

and then the Spring Boot banner will not be printed on startup, and the application will not be a web application.

**Note**

The example above also demonstrates how flexible binding allows the use of underscores (\_) as well as dashes (-) in property names.

Properties defined in external configuration overrides the values specified via the Java API with the notable exception of the sources used to create the ApplicationContext. Let’s consider this application

**new** SpringApplicationBuilder()

.bannerMode(Banner.Mode.OFF)

.sources(demo.MyApp.**class**)

.run(args);

used with the following configuration:

**spring.main.sources**=com.acme.Config,com.acme.ExtraConfig **spring.main.banner-mode**=console

The actual application will *now* show the banner (as overridden by configuration) and use three sources for the ApplicationContext (in that order): demo.MyApp, com.acme.Config, com.acme.ExtraConfig.

## Change the location of external properties of an application

By default properties from different sources are added to the Spring Environment in a defined order (see [*Chapter 24, Externalized Configuration*](#_bookmark97) in the ‘Spring Boot features’ section for the exact order).

A nice way to augment and modify this is to add @PropertySource annotations to your application sources. Classes passed to the SpringApplication static convenience methods, and those added using setSources() are inspected to see if they have @PropertySources, and if they do, those properties are added to the Environment early enough to be used in all phases of the ApplicationContext lifecycle. Properties added in this way have lower priority than any added using the default locations (e.g. application.properties), system properties, environment variables or the command line.

You can also provide System properties (or environment variables) to change the behavior:

* spring.config.name (SPRING\_CONFIG\_NAME), defaults to application as the root of the file name.
* spring.config.location (SPRING\_CONFIG\_LOCATION) is the file to load (e.g. a classpath resource or a URL). A separate Environment property source is set up for this document and it can be overridden by system properties, environment variables or the command line.

No matter what you set in the environment, Spring Boot will always load application.properties as described above. If YAML is used then files with the ‘.yml’ extension are also added to the list by default.

Spring Boot logs the configuration files that are loaded at DEBUG level and the candidates it has not found at TRACE level.

See [ConfigFileApplicationListener](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/context/config/ConfigFileApplicationListener.java) for more detail.

## Use ‘short’ command line arguments

Some people like to use (for example) --port=9000 instead of --server.port=9000 to set configuration properties on the command line. You can easily enable this by using placeholders in application.properties, e.g.

**server.port**=${port:8080}

**Tip**

If you are inheriting from the spring-boot-starter-parent POM, the default filter token of the maven-resources-plugins has been changed from ${\*} to @ (i.e. @maven.token@ instead of ${maven.token}) to prevent conflicts with Spring-style placeholders. If you have enabled maven filtering for the application.properties directly, you may want to also change the default filter token to use [other delimiters](http://maven.apache.org/plugins/maven-resources-plugin/resources-mojo.html#delimiters).

**Note**

In this specific case the port binding will work in a PaaS environment like Heroku and Cloud Foundry, since in those two platforms the PORT environment variable is set automatically and Spring can bind to capitalized synonyms for Environment properties.

## Use YAML for external properties

YAML is a superset of JSON and as such is a very convenient syntax for storing external properties in a hierarchical format. E.g.

**spring**:

**application**:

**name**: cruncher

**datasource**:

**driverClassName**: com.mysql.jdbc.Driver

**url**: jdbc:mysql://localhost/test

**server**:

**port**: 9000

Create a file called application.yml and stick it in the root of your classpath, and also add snakeyaml to your dependencies (Maven coordinates org.yaml:snakeyaml, already included if you use the spring-boot-starter). A YAML file is parsed to a Java Map<String,Object> (like a JSON object), and Spring Boot flattens the map so that it is 1-level deep and has period-separated keys, a lot like people are used to with Properties files in Java.

The example YAML above corresponds to an application.properties file

**spring.application.name**=cruncher **spring.datasource.driverClassName**=com.mysql.jdbc.Driver **spring.datasource.url**=jdbc:mysql://localhost/test **server.port**=9000

See [*Section 24.6, “Using YAML instead of Properties”*](#_bookmark103) in the ‘Spring Boot features’ section for more information about YAML.

## Set the active Spring profiles

The Spring Environment has an API for this, but normally you would set a System property (spring.profiles.active) or an OS environment variable (SPRING\_PROFILES\_ACTIVE). E.g. launch your application with a -D argument (remember to put it before the main class or jar archive):

$ java -jar -Dspring.profiles.active=production demo-0.0.1-SNAPSHOT.jar

In Spring Boot you can also set the active profile in application.properties, e.g.

**spring.profiles.active**=production

A value set this way is replaced by the System property or environment variable setting, but not by the SpringApplicationBuilder.profiles() method. Thus the latter Java API can be used to augment the profiles without changing the defaults.

See [*Chapter 25, Profiles*](#_bookmark115) in the ‘Spring Boot features’ section for more information.

## Change configuration depending on the environment

A YAML file is actually a sequence of documents separated by --- lines, and each document is parsed separately to a flattened map.

If a YAML document contains a spring.profiles key, then the profiles value (comma-separated list of profiles) is fed into the Spring Environment.acceptsProfiles() and if any of those profiles is active that document is included in the final merge (otherwise not).

Example:

**server**:

**port**: 9000

*---*

**spring**:

**profiles**: development

**server**:

**port**: 9001

*---*

**spring**:

**profiles**: production

**server**:

**port**: 0

In this example the default port is 9000, but if the Spring profile ‘development’ is active then the port is 9001, and if ‘production’ is active then it is 0.

The YAML documents are merged in the order they are encountered (so later values override earlier ones).

To do the same thing with properties files you can use application-${profile}.properties to specify profile-specific values.

## Discover built-in options for external properties

Spring Boot binds external properties from application.properties (or .yml) (and other places) into an application at runtime. There is not (and technically cannot be) an exhaustive list of all supported properties in a single location because contributions can come from additional jar files on your classpath.

A running application with the Actuator features has a configprops endpoint that shows all the bound and bindable properties available through @ConfigurationProperties.

The appendix includes an [application.properties](#_bookmark569) example with a list of the most common properties supported by Spring Boot. The definitive list comes from searching the source code for @ConfigurationProperties and @Value annotations, as well as the occasional use of RelaxedPropertyResolver.

# Embedded servlet containers

## Add a Servlet, Filter or Listener to an application

There are two ways to add Servlet, Filter, ServletContextListener and the other listeners supported by the Servlet spec to your application. You can either provide Spring beans for them, or enable scanning for Servlet components.

### Add a Servlet, Filter or Listener using a Spring bean

To add a Servlet, Filter, or Servlet \*Listener provide a @Bean definition for it. This can be very useful when you want to inject configuration or dependencies. However, you must be very careful that they don’t cause eager initialization of too many other beans because they have to be installed in the container very early in the application lifecycle (e.g. it’s not a good idea to have them depend on your DataSource or JPA configuration). You can work around restrictions like that by initializing them lazily when first used instead of on initialization.

In the case of Filters and Servlets you can also add mappings and init parameters by adding a FilterRegistrationBean or ServletRegistrationBean instead of or as well as the underlying component.

**Note**

If no dispatcherType is specified on a filter registration, it will match FORWARD,INCLUDE and

REQUEST. If async has been enabled, it will match ASYNC as well.

If you are migrating a filter that has no dispatcher element in web.xml you will need to specify a dispatcherType yourself:

@Bean

**public** FilterRegistrationBean myFilterRegistration() { FilterRegistrationBean registration = **new** FilterRegistrationBean(); registration.setDispatcherTypes(DispatcherType.REQUEST);

....

**return** registration;

}

#### Disable registration of a Servlet or Filter

As [described above](#_bookmark458) any Servlet or Filter beans will be registered with the servlet container automatically. To disable registration of a particular Filter or Servlet bean create a registration bean for it and mark it as disabled. For example:

@Bean

**public** FilterRegistrationBean registration(MyFilter filter) { FilterRegistrationBean registration = **new** FilterRegistrationBean(filter); registration.setEnabled(false);

**return** registration;

}

### Add Servlets, Filters, and Listeners using classpath scanning

@WebServlet, @WebFilter, and @WebListener annotated classes can be automatically registered with an embedded servlet container by annotating a @Configuration class with

@ServletComponentScan and specifying the package(s) containing the components that you want to register. By default, @ServletComponentScan will scan from the package of the annotated class.

## Change the HTTP port

In a standalone application the main HTTP port defaults to 8080, but can be set with server.port (e.g. in application.properties or as a System property). Thanks to relaxed binding of Environment values you can also use SERVER\_PORT (e.g. as an OS environment variable).

To switch off the HTTP endpoints completely, but still create a WebApplicationContext, use

server.port=-1 (this is sometimes useful for testing).

For more details look at [*the section called “Customizing embedded servlet containers”*](#_bookmark152) in the ‘Spring Boot features’ section, or the [ServerProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/ServerProperties.java) source code.

## Use a random unassigned HTTP port

To scan for a free port (using OS natives to prevent clashes) use server.port=0.

## Discover the HTTP port at runtime

You can access the port the server is running on from log output or from the EmbeddedWebApplicationContext via its EmbeddedServletContainer. The best way to get that and be sure that it has initialized is to add a @Bean of type ApplicationListener<EmbeddedServletContainerInitializedEvent> and pull the container out of the event when it is published.

Tests that use @SpringBootTest(webEnvironment=WebEnvironment.RANDOM\_PORT) can also inject the actual port into a field using the @LocalServerPort annotation. For example:

@RunWith(SpringJUnit4ClassRunner.class) @SpringBootTest(webEnvironment=WebEnvironment.RANDOM\_PORT) **public class** MyWebIntegrationTests {

@Autowired EmbeddedWebApplicationContext server;

@LocalServerPort

**int** port;

*// ...*

}

**Note**

@LocalServerPort is a meta-annotation for @Value("${local.server.port}"). Don’t try to inject the port in a regular application. As we just saw, the value is only set once the container has initialized; contrary to a test, application code callbacks are processed early (i.e. before the value is actually available).

## Configure SSL

SSL can be configured declaratively by setting the various server.ssl.\* properties, typically in

application.properties or application.yml. For example:

**server.port**=8443

**server.ssl.key-store**=classpath:keystore.jks **server.ssl.key-store-password**=secret **server.ssl.key-password**=another-secret

See [Ssl](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/context/embedded/Ssl.java) for details of all of the supported properties.

Using configuration like the example above means the application will no longer support plain HTTP connector at port 8080. Spring Boot doesn’t support the configuration of both an HTTP connector and an HTTPS connector via application.properties. If you want to have both then you’ll need to configure one of them programmatically. It’s recommended to use application.properties to configure HTTPS as the HTTP connector is the easier of the two to configure programmatically. See the [spring-boot-sample-tomcat-multi-connectors](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-tomcat-multi-connectors) sample project for an example.

## Configure Access Logging

Access logs can be configured for Tomcat and Undertow via their respective namespaces. For instance, the following logs access on Tomcat with a [custom pattern](https://tomcat.apache.org/tomcat-8.0-doc/config/valve.html#Access_Logging).

**server.tomcat.basedir**=my-tomcat **server.tomcat.accesslog.enabled**=true **server.tomcat.accesslog.pattern**=%t %a "%r" %s (%D ms)

**Note**

The default location for logs is a logs directory relative to the tomcat base dir and said directory is a temp directory by default so you may want to fix Tomcat’s base directory or use an absolute path for the logs. In the example above, the logs will be available in my-tomcat/logs relative to the working directory of the application.

Access logging for undertow can be configured in a similar fashion

**server.undertow.accesslog.enabled**=true **server.undertow.accesslog.pattern**=%t %a "%r" %s (%D ms)

Logs are stored in a logs directory relative to the working directory of the application. This can be customized via server.undertow.accesslog.directory.

## Use behind a front-end proxy server

Your application might need to send 302 redirects or render content with absolute links back to itself. When running behind a proxy, the caller wants a link to the proxy, and not to the physical address of the machine hosting your app. Typically such situations are handled via a contract with the proxy, which will add headers to tell the back end how to construct links to itself.

If the proxy adds conventional X-Forwarded-For and X-Forwarded-Proto headers (most do this out of the box) the absolute links should be rendered correctly as long as server.use-forward- headers is set to true in your application.properties.

**Note**

If your application is running in Cloud Foundry or Heroku the server.use-forward-headers

property will default to true if not specified. In all other instances it defaults to false.

### Customize Tomcat’s proxy configuration

If you are using Tomcat you can additionally configure the names of the headers used to carry “forwarded” information:

server.tomcat.remote-ip-header=x-your-remote-ip-header server.tomcat.protocol-header=x-your-protocol-header

Tomcat is also configured with a default regular expression that matches internal proxies that are to be trusted. By default, IP addresses in 10/8, 192.168/16, 169.254/16 and 127/8 are trusted. You can customize the valve’s configuration by adding an entry to application.properties, e.g.

server.tomcat.internal-proxies=192\\.168\\.\\d{1,3}\\.\\d{1,3}

**Note**

The double backslashes are only required when you’re using a properties file for configuration. If you are using YAML, single backslashes are sufficient and a value that’s equivalent to the one shown above would be 192\.168\.\d{1,3}\.\d{1,3}.

**Note**

You can trust all proxies by setting the internal-proxies to empty (but don’t do this in production).

You can take complete control of the configuration of Tomcat’s RemoteIpValve by switching the automatic one off (i.e. set server.use-forward-headers=false) and adding a new valve instance in a TomcatEmbeddedServletContainerFactory bean.

## Configure Tomcat

Generally you can follow the advice from [*Section 72.8, “Discover built-in options for external properties”*](#_bookmark455)about @ConfigurationProperties (ServerProperties is the main one here), but also look at EmbeddedServletContainerCustomizer and various Tomcat-specific \*Customizers that you can add in one of those. The Tomcat APIs are quite rich so once you have access to the TomcatEmbeddedServletContainerFactory you can modify it in a number of ways. Or the nuclear option is to add your own TomcatEmbeddedServletContainerFactory.

## Enable Multiple Connectors with Tomcat

Add a org.apache.catalina.connector.Connector to the TomcatEmbeddedServletContainerFactory which can allow multiple connectors, e.g. HTTP and HTTPS connector:

@Bean

**public** EmbeddedServletContainerFactory servletContainer() { TomcatEmbeddedServletContainerFactory tomcat = **new** TomcatEmbeddedServletContainerFactory(); tomcat.addAdditionalTomcatConnectors(createSslConnector());

**return** tomcat;

}

**private** Connector createSslConnector() {

Connector connector = **new** Connector(***"org.apache.coyote.http11.Http11NioProtocol"***); Http11NioProtocol protocol = (Http11NioProtocol) connector.getProtocolHandler();

**try** {

File keystore = **new** ClassPathResource(***"keystore"***).getFile(); File truststore = **new** ClassPathResource(***"keystore"***).getFile(); connector.setScheme(***"https"***);

connector.setSecure(true); connector.setPort(8443); protocol.setSSLEnabled(true);

protocol.setKeystoreFile(keystore.getAbsolutePath()); protocol.setKeystorePass(***"changeit"***); protocol.setTruststoreFile(truststore.getAbsolutePath()); protocol.setTruststorePass(***"changeit"***); protocol.setKeyAlias(***"apitester"***);

**return** connector;

}

**catch** (IOException ex) {

**throw new** IllegalStateException(***"can't access keystore: ["*** + ***"keystore"***

+ ***"] or truststore: ["*** + ***"keystore"*** + ***"]"***, ex);

}

}

## Use Tomcat’s LegacyCookieProcessor

The embedded Tomcat used by Spring Boot does not support "Version 0" of the Cookie format out of the box, and you may see the following error:

java.lang.IllegalArgumentException: An invalid character [32] was present in the Cookie value

If at all possible, you should consider updating your code to only store values compliant with later Cookie specifications. If, however, you’re unable to change the way that cookies are written, you can instead configure Tomcat to use a LegacyCookieProcessor. To switch to the LegacyCookieProcessor use an EmbeddedServletContainerCustomizer bean that adds a TomcatContextCustomizer:

@Bean

**public** EmbeddedServletContainerCustomizer cookieProcessorCustomizer() {

**return new** EmbeddedServletContainerCustomizer() {

@Override

**public void** customize(ConfigurableEmbeddedServletContainer container) {

**if** (container **instanceof** TomcatEmbeddedServletContainerFactory) { ((TomcatEmbeddedServletContainerFactory) container)

.addContextCustomizers(**new** TomcatContextCustomizer() {

@Override

**public void** customize(Context context) { context.setCookieProcessor(**new** LegacyCookieProcessor());

}

});

}

}

};

}

## Use Jetty instead of Tomcat

The Spring Boot starters (spring-boot-starter-web in particular) use Tomcat as an embedded container by default. You need to exclude those dependencies and include the Jetty one instead. Spring Boot provides Tomcat and Jetty dependencies bundled together as separate starters to help make this process as easy as possible.

Example in Maven:

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-web**</artifactId>**

**<exclusions>**

**<exclusion>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-tomcat**</artifactId>**

**</exclusion>**

**</exclusions>**

**</dependency>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-jetty**</artifactId>**

**</dependency>**

Example in Gradle:

configurations {

compile.exclude module: ***"spring-boot-starter-tomcat"***

}

dependencies {

compile(***"org.springframework.boot:spring-boot-starter-web:1.5.8.RELEASE"***) compile(***"org.springframework.boot:spring-boot-starter-jetty:1.5.8.RELEASE"***)

*// ...*

}

## Configure Jetty

Generally you can follow the advice from [*Section 72.8, “Discover built-in options for external properties”*](#_bookmark455)about @ConfigurationProperties (ServerProperties is the main one here), but also look at EmbeddedServletContainerCustomizer. The Jetty APIs are quite rich so once you have access to the JettyEmbeddedServletContainerFactory you can modify it in a number of ways. Or the nuclear option is to add your own JettyEmbeddedServletContainerFactory.

## Use Undertow instead of Tomcat

Using Undertow instead of Tomcat is very similar to [using Jetty instead of Tomcat](#_bookmark471). You need to exclude the Tomcat dependencies and include the Undertow starter instead.

Example in Maven:

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-web**</artifactId>**

**<exclusions>**

**<exclusion>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-tomcat**</artifactId>**

**</exclusion>**

**</exclusions>**

**</dependency>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-undertow**</artifactId>**

**</dependency>**

Example in Gradle:

configurations {

compile.exclude module: ***"spring-boot-starter-tomcat"***

}

dependencies {

compile(***"org.springframework.boot:spring-boot-starter-web:1.5.8.RELEASE"***) compile(***"org.springframework.boot:spring-boot-starter-undertow:1.5.8.RELEASE"***)

*// ...*

}

## Configure Undertow

Generally you can follow the advice from [*Section 72.8, “Discover built-in options for external properties”*](#_bookmark455)about @ConfigurationProperties (ServerProperties and ServerProperties.Undertow are the main ones here), but also look at EmbeddedServletContainerCustomizer. Once you have access to the UndertowEmbeddedServletContainerFactory you can use an UndertowBuilderCustomizer to modify Undertow’s configuration to meet your needs. Or the nuclear option is to add your own UndertowEmbeddedServletContainerFactory.

## Enable Multiple Listeners with Undertow

Add an UndertowBuilderCustomizer to the UndertowEmbeddedServletContainerFactory

and add a listener to the Builder:

@Bean

**public** UndertowEmbeddedServletContainerFactory embeddedServletContainerFactory() { UndertowEmbeddedServletContainerFactory factory = **new** UndertowEmbeddedServletContainerFactory(); factory.addBuilderCustomizers(**new** UndertowBuilderCustomizer() {

@Override

**public void** customize(Builder builder) { builder.addHttpListener(8080, ***"0.0.0.0"***);

}

});

**return** factory;

}

## Use Tomcat 7.x or 8.0

Tomcat 7 & 8.0 work with Spring Boot, but the default is to use Tomcat 8.5. If you cannot use Tomcat

8.5 (for example, because you are using Java 1.6) you will need to change your classpath to reference a different version.

### Use Tomcat 7.x or 8.0 with Maven

If you are using the starters and parent you can change the Tomcat version property and additionally import tomcat-juli. E.g. for a simple webapp or service:

**<properties>**

**<tomcat.version>**7.0.59**</tomcat.version>**

**</properties>**

**<dependencies>**

...

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-web**</artifactId>**

**</dependency>**

**<dependency>**

**<groupId>**org.apache.tomcat**</groupId>**

**<artifactId>**tomcat-juli**</artifactId>**

**<version>**${tomcat.version}**</version>**

**</dependency>**

...

**</dependencies>**

### Use Tomcat 7.x or 8.0 with Gradle

With Gradle, you can change the Tomcat version by setting the tomcat.version property and then additionally include tomcat-juli:

ext[***'tomcat.version'***] = ***'7.0.59'***

dependencies {

compile ***'org.springframework.boot:spring-boot-starter-web'***

compile group:***'org.apache.tomcat'***, name:***'tomcat-juli'***, version:property(***'tomcat.version'***)

}

## Use Jetty 9.2

Jetty 9.2 works with Spring Boot, but the default is to use Jetty 9.3. If you cannot use Jetty 9.3 (for example, because you are using Java 7) you will need to change your classpath to reference Jetty 9.2.

### Use Jetty 9.2 with Maven

If you are using the starters and parent you can just add the Jetty starter and override the

jetty.version property:

**<properties>**

**<jetty.version>**9.2.17.v20160517**</jetty.version>**

**</properties>**

**<dependencies>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-web**</artifactId>**

**<exclusions>**

**<exclusion>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-tomcat**</artifactId>**

**</exclusion>**

**</exclusions>**

**</dependency>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-jetty**</artifactId>**

**</dependency>**

**</dependencies>**

### Use Jetty 9.2 with Gradle

You can set the jetty.version property. For example, for a simple webapp or service:

ext[***'jetty.version'***] = ***'9.2.17.v20160517'***

dependencies {

compile (***'org.springframework.boot:spring-boot-starter-web'***) {

exclude group: ***'org.springframework.boot'***, module: ***'spring-boot-starter-tomcat'***

}

compile (***'org.springframework.boot:spring-boot-starter-jetty'***)

}

## Use Jetty 8

Jetty 8 works with Spring Boot, but the default is to use Jetty 9.3. If you cannot use Jetty 9.3 (for example, because you are using Java 1.6) you will need to change your classpath to reference Jetty 8. You will also need to exclude Jetty’s WebSocket-related dependencies.

### Use Jetty 8 with Maven

If you are using the starters and parent you can just add the Jetty starter with the required WebSocket exclusion and change the version properties, e.g. for a simple webapp or service:

**<properties>**

**<jetty.version>**8.1.15.v20140411**</jetty.version>**

**<jetty-jsp.version>**2.2.0.v201112011158**</jetty-jsp.version>**

**</properties>**

**<dependencies>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-web**</artifactId>**

**<exclusions>**

**<exclusion>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-tomcat**</artifactId>**

**</exclusion>**

**</exclusions>**

**</dependency>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-jetty**</artifactId>**

**<exclusions>**

**<exclusion>**

**<groupId>**org.eclipse.jetty.websocket**</groupId>**

**<artifactId>**\***</artifactId>**

**</exclusion>**

**</exclusions>**

**</dependency>**

**</dependencies>**

### Use Jetty 8 with Gradle

You can set the jetty.version property and exclude the WebSocket dependency, e.g. for a simple webapp or service:

ext[***'jetty.version'***] = ***'8.1.15.v20140411'***

dependencies {

compile (***'org.springframework.boot:spring-boot-starter-web'***) {

exclude group: ***'org.springframework.boot'***, module: ***'spring-boot-starter-tomcat'***

}

compile (***'org.springframework.boot:spring-boot-starter-jetty'***) { exclude group: ***'org.eclipse.jetty.websocket'***

}

}

## Create WebSocket endpoints using @ServerEndpoint

If you want to use @ServerEndpoint in a Spring Boot application that used an embedded container, you must declare a single ServerEndpointExporter @Bean:

@Bean

**public** ServerEndpointExporter serverEndpointExporter() {

**return new** ServerEndpointExporter();

}

This bean will register any @ServerEndpoint annotated beans with the underlying WebSocket container. When deployed to a standalone servlet container this role is performed by a servlet container initializer and the ServerEndpointExporter bean is not required.

## Enable HTTP response compression

HTTP response compression is supported by Jetty, Tomcat, and Undertow. It can be enabled via

application.properties:

**server.compression.enabled**=true

By default, responses must be at least 2048 bytes in length for compression to be performed. This can be configured using the server.compression.min-response-size property.

By default, responses will only be compressed if their content type is one of the following:

* text/html
* text/xml
* text/plain
* text/css

This can be configured using the server.compression.mime-types property.

# Spring MVC

## 编写一个 JSON REST 服务

只要Jackson2在类路径上，Spring Boot应用程序中的任何Spring @RestController默认都会呈现JSON响应。 例如：

@RestController

**public class** MyController {

@RequestMapping("/thing")

**public** MyThing thing() {

**return new** MyThing();

}

}

只要MyThing可以被Jackson2序列化（例如普通的POJO或者Groovy对象），那么默认情况下localhost:8080/thing将为其提供JSON表示。 有时在浏览器中，您可能会看到XML响应，因为浏览器倾向于发送喜欢XML的接受标头。

## 编写一个 XML REST 服务

如果你在类路径上有Jackson XML扩展（jackson-dataformat-xml），它将被用来呈现XML响应，和我们用于JSON的例子一样。 要使用它，请将以下依赖项添加到您的项目中：

**<dependency>**

**<groupId>**com.fasterxml.jackson.dataformat**</groupId>**

**<artifactId>**jackson-dataformat-xml**</artifactId>**

**</dependency>**

您可能还想添加对Woodstox的依赖。 它比JDK提供的默认StAX实现更快，并且还增加了漂亮的打印支持和改进的命名空间处理：

**<dependency>**

**<groupId>**org.codehaus.woodstox**</groupId>**

**<artifactId>**woodstox-core-asl**</artifactId>**

**</dependency>**

如果Jackson的XML扩展不可用，那么将使用JAXB（在JDK中默认提供），并附加要求将MyThing注释为@XmlRootElement：

@XmlRootElement

**public class** MyThing {

**private** String name;

*// .. getters and setters*

}

要让服务器呈现XML而不是JSON，您可能需要发送Accept：text/xml 头（或使用浏览器）。

## 自定义 Jackson ObjectMapper

Spring MVC（客户端和服务器端）使用HttpMessageConverters来协商HTTP交换中的内容转换。 如果Jackson在类路径中，则已经获得由Jackson2ObjectMapperBuilder提供的默认转换器，其中的一个实例将为您自动配置。

默认情况下创建的ObjectMapper（或用于Jackson XML转换器的XmlMapper）实例具有以下自定义属性：

* MapperFeature.DEFAULT\_VIEW\_INCLUSION已禁用
* DeserializationFeature.FAIL\_ON\_UNKNOWN\_PROPERTIES已禁用

Spring Boot 还具有一些功能，可以更轻松地自定义此行为。

You can configure the ObjectMapper and XmlMapper instances using the environment. Jackson provides an extensive suite of simple on/off features that can be used to configure various aspects of its processing. These features are described in six enums in Jackson which map onto properties in the environment:

|  |  |
| --- | --- |
| **Jackson enum** | **Environment property** |
| com.fasterxml.jackson.  databind.DeserializationFeature | spring.jackson.deserialization.  <feature\_name>=true|false |
| com.fasterxml.jackson.  core.JsonGenerator.Feature | spring.jackson.generator.  <feature\_name>=true|false |
| com.fasterxml.jackson.  databind.MapperFeature | spring.jackson.mapper.  <feature\_name>=true|false |
| com.fasterxml.jackson.core.  JsonParser.Feature | spring.jackson.parser.  <feature\_name>=true|false |
| com.fasterxml.jackson.  databind.SerializationFeature | spring.jackson.serialization.  <feature\_name>=true|false |
| com.fasterxml.jackson  .annotation.JsonInclude.Include | spring.jackson.default-property-inclusion=always|non\_null|  non\_absent|non\_default|non\_empty |

例如，要启用漂亮的打印，请设置spring.jackson.serialization.indent\_output = true。 请注意，由于使用[relaxed](#_bookmark111) [binding](#_bookmark111)，indent\_output的情况不必与相应的枚举常量INDENT\_OUTPUT的情况相匹配。

此基于环境的配置应用于自动配置的Jackson2ObjectMapperBuilder bean，并将应用于使用构建器创建的任何映射器，包括自动配置(auto-configured)的ObjectMapper bean。

任何com.fasterxml.jackson.databind.Module类型的bean都将自动注册到自动配置的Jackson2ObjectMapperBuilder中，并应用于它创建的任何ObjectMapper实例。 这为在向应用程序添加新功能时提供了一种全局机制来提供自定义模块。

如果要完全替换默认的ObjectMapper，则可以定义该类型的@Bean并将其标记为@Primary，或者，如果您更喜欢基于构建器的方法，请定义一个Jackson2ObjectMapperBuilder @Bean。 请注意，在任何情况下，这将禁用ObjectMapper的所有自动配置。

如果您提供了MappingJackson2HttpMessageConverter类型的@Beans，那么它们将替换MVC配置中的默认值。 此外，提供了一个便捷的Bean类型HttpMessageConverters（总是可用，如果您使用默认的MVC配置），有一些有用的方法来访问默认和用户增强的消息转换器(user-enhanced message converters)。

另外请参考 [*Section 74.4, “Customize the @ResponseBody rendering”*](#_bookmark491)部分和

[WebMvcAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/WebMvcAutoConfiguration.java) 源码查看更多详细信息。

## 自定义 @ResponseBody rendering

Spring使用HttpMessageConverters呈现@ResponseBody（或来自@RestController的响应）。 您可以通过在Spring Boot context中简单添加该类型的bean来提供额外的转换器。 如果您添加的bean是默认包含的类型（如用于JSON转换的MappingJackson2HttpMessageConverter），那么它将替换默认值。 提供了一个类型为HttpMessageConverters的便利bean（如果使用默认的MVC配置，总是可用的），它有一些有用的方法来访问默认的和用户增强的消息转换器（例如，如果您想手动将它们注入自定义的RestTemplate）。

和正常的MVC用法一样，您提供的任何WebMvcConfigurerAdapter bean都可以通过重写configureMessageConverters方法来提供转换器，但与普通MVC不同的是，您只能提供所需的其他转换器（因为Spring Boot使用相同的机制来提供其默认值）。 最后，如果您通过提供自己的@EnableWebMvc配置来选择退出Spring Boot默认MVC配置，那么您可以完全控制并使用来自WebMvcConfigurationSupport的getMessageConverters手动执行所有操作。

查看 [WebMvcAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/WebMvcAutoConfiguration.java) 源码获取更多信息。

## Handling Multipart File Uploads

Spring Boot包含Servlet 3 javax.servlet.http.Part API来支持上传文件。 默认情况下，Spring Boot在每个文件中配置最大文件为1MB，单个请求中最大为10MB的文件数据。 您可以通过使用MultipartProperties类中公开的属性来覆盖这些值以及存储中间数据的位置（例如，到 /tmp目录）和将数据刷新到磁盘的阈值。 例如，如果要指定文件不受限制，请将spring.http.multipart.max-file-size属性设置为-1。

当您想在Spring MVC控制器处理程序方法中将Multipart编码的文件数据作为MultipartFile类型的@ RequestParam注释参数接收时，multipart support很有帮助。

查看 [MultipartAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/MultipartAutoConfiguration.java) 源码获取更多信息。

## 关闭 Spring MVC DispatcherServlet

Spring Boot希望从应用程序的根目录下载所有内容。 如果您宁愿将您自己的servlet映射到该URL，则可以这样做，但是当然可能会失去其他一些Boot MVC功能。 要添加自己的servlet并将其映射到根资源，只需声明一个类型为Servlet的@Bean，并为其指定一个特殊的bean名称dispatcherServlet（如果要关闭它，也可以使用该名称创建一个不同类型的bean） 不能取代它）。

## 关闭默认 MVC 配置

完全控制MVC配置的最简单的方法是使用@EnableWebMvc注解提供自己的@Configuration。这将使所有的MVC配置在你的hands。

## 自定义 ViewResolvers

ViewResolver是Spring MVC的核心组件，将@Controller中的视图名称转换为实际的View实现。 请注意，ViewResolvers主要用于UI应用程序，而不是REST风格的服务（View不用于呈现@ResponseBody）。 有很多ViewResolver的实现可供选择，而Spring本身并不认为你应该使用哪一个。 另一方面，Spring Boot根据在类路径和应用程序上下文(application context)中找到的内容，为您安装一个或两个。 DispatcherServlet使用它在应用程序上下文中找到的所有解析器，依次尝试每个解析器，直到获得结果，所以如果要添加自己的解析器，则必须知道该解析器添加的顺序和位置。

WebMvcAutoConfiguration将以下ViewResolver添加到您的上下文中：

* 具有bean id“defaultViewResolver”的InternalResourceViewResolver。 这个查找可以使用DefaultServlet呈现的物理资源（例如，如果使用的是静态资源和JSP页面）。 它将前缀和后缀应用于视图名称，然后在servlet上下文中查找具有该路径的物理资源（默认值均为空，但可通过spring.mvc.view.prefix和spring.mvc.view.suffix访问外部配置）。 它可以通过提供相同类型的bean来重写。[blog about ContentNegotiatingViewResolver](https://spring.io/blog/2013/06/03/content-negotiation-using-views)
* 一个带有“beanNameViewResolver”的BeanNameViewResolver。 这是视图解析器链中的一个有用的成员，并且将拾取与正在解析的视图名称相同的所有bean。 不应该有必要重写或替换它。
* 如果实际上有View类型的bean，则仅添加id为“viewResolver”的ContentNegotiatingViewResolver。 这是一个“主”解析器，委托给所有其他人，试图找到与客户端发送的“接受”HTTP头匹配。 有一个关于[blog about ContentNegotiatingViewResolver](https://spring.io/blog/2013/06/03/content-negotiation-using-views) ，你可能想了解更多，也可以看看源代码的细节。 您可以通过定义一个名为“viewResolver”的bean来关闭自动配置的ContentNegotiatingViewResolver。
* 如果您使用Thymeleaf，您也将拥有一个带有“thymeleafViewResolver”的ThymeleafViewResolver。 它通过用前缀和后缀来包围视图名称来查找资源（外部化为spring.thymeleaf.prefix和spring.thymeleaf.suffix，分别为默认的'classpath：/ templates /'和'.html'）。 它可以通过提供一个相同名字的bean来覆盖。
* 如果您使用FreeMarker，您也将拥有一个ID为“freeMarkerViewResolver”的FreeMarkerViewResolver。 它通过使用前缀和后缀包围视图名称来查找加载器路径中的资源（外化为spring.freemarker.templateLoaderPath，默认为“classpath：/ templates /”）（外化为spring.freemarker.prefix和spring.freemarker.suffix ，分别为空和'.ftl'的默认值）。 它可以通过提供一个相同名字的bean来覆盖。
* 如果您使用Groovy模板（实际上，如果groovy-templates位于您的类路径中），那么您也将拥有一个带有“groovyMarkupViewResolver”标识的GroovyMarkupViewResolver。 它通过用前缀和后缀包围视图名称来查找加载器路径中的资源（外化为spring.groovy.template.prefix和spring.groovy.template.suffix，默认为'classpath：/ templates /'和'.tpl' 分别）。 它可以通过提供一个相同名字的bean来覆盖。

查看[WebMvcAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/WebMvcAutoConfiguration.java),[ThymeleafAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/thymeleaf/ThymeleafAutoConfiguration.java), [FreeMarkerAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/freemarker/FreeMarkerAutoConfiguration.java) 和[GroovyTemplateAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/groovy/template/GroovyTemplateAutoConfiguration.java)

## 使用 Thymeleaf 3

默认情况下，spring-boot-starter-thymeleaf使用Thymeleaf 2.1。 如果您使用的是spring-boot-starter-parent，则可以通过覆盖thymeleaf.version和thymeleaf-layout-dialect.version属性来使用Thymeleaf 3，例如：

**<properties>**

**<thymeleaf.version>**3.0.2.RELEASE**</thymeleaf.version>**

**<thymeleaf-layout-dialect.version>**2.1.1**</thymeleaf-layout-dialect.version>**

**</properties>**

**Note**

如果您自己正在管理依赖关系，请查看与这两个版本相关的工件列表的spring-boot-dependencies。

要避免出现关于不推荐使用HTML 5模板模式和正在使用HTML模板模式的警告消息，您可能还需要将spring.thymeleaf.mode明确配置为HTML，例如：

**spring.thymeleaf.mode**: HTML

请参阅[Thymeleaf 3 sample](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-web-thymeleaf3) 样本以查看此操作。

如果您正在使用任何其他自动配置的Thymeleaf Extras（Spring Security，Data Attribute或Java 8 Time），则还应该将其每个版本覆盖为与Thymeleaf 3.0兼容的版本。

# HTTP clients

## 使用代理配置 RestTemplate

如第[Section 33.1, “RestTemplate customization”](#_bookmark244)中所述，RestTemplateCustomizer可以与RestTemplateBuilder配合使用来构建定制的RestTemplate。 这是创建配置为使用代理的RestTemplate的推荐方法。

代理配置的确切细节取决于正在使用的底层客户端请求工厂。 下面是一个使用HttpClient配置HttpComponentsClientRequesfor all hosts except 192.168.0.5.

**static class** ProxyCustomizer **implements** RestTemplateCustomizer {

@Override

**public void** customize(RestTemplate restTemplate) { HttpHost proxy = **new** HttpHost(***"proxy.example.com"***); HttpClient httpClient = HttpClientBuilder.create()

.setRoutePlanner(**new** DefaultProxyRoutePlanner(proxy) {

@Override

**public** HttpHost determineProxy(HttpHost target, HttpRequest request, HttpContext context)

**throws** HttpException {

**if** (target.getHostName().equals(***"192.168.0.5"***)) {

**return** null;

}

**return super**.determineProxy(target, request, context);

}

}).build(); restTemplate.setRequestFactory(

**new** HttpComponentsClientHttpRequestFactory(httpClient));

}

}

# Logging

Spring Boot has no mandatory logging dependency, except for the Commons Logging API, of which there are many implementations to choose from. To use [Logback](http://logback.qos.ch/) you need to include it and jcl-over- slf4j (which implements the Commons Logging API) on the classpath. The simplest way to do that is through the starters which all depend on spring-boot-starter-logging. For a web application you only need spring-boot-starter-web since it depends transitively on the logging starter. For example, using Maven:

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-web**</artifactId>**

**</dependency>**

Spring Boot has a LoggingSystem abstraction that attempts to configure logging based on the content of the classpath. If Logback is available it is the first choice.

If the only change you need to make to logging is to set the levels of various loggers then you can do that in application.properties using the "logging.level" prefix, e.g.

**logging.level.org.springframework.web**=DEBUG **logging.level.org.hibernate**=ERROR

You can also set the location of a file to log to (in addition to the console) using "logging.file".

To configure the more fine-grained settings of a logging system you need to use the native configuration format supported by the LoggingSystem in question. By default Spring Boot picks up the native configuration from its default location for the system (e.g. classpath:logback.xml for Logback), but you can set the location of the config file using the "logging.config" property.

## Configure Logback for logging

If you put a logback.xml in the root of your classpath it will be picked up from there (or logback- spring.xml to take advantage of the templating features provided by Boot). Spring Boot provides a default base configuration that you can include if you just want to set levels, e.g.

<?xml version="1.0" encoding="UTF-8"?>

**<configuration>**

**<include resource**=**"org/springframework/boot/logging/logback/base.xml"/>**

**<logger name**=**"org.springframework.web" level**=**"DEBUG"/>**

**</configuration>**

If you look at that base.xml in the spring-boot jar, you will see that it uses some useful System properties which the LoggingSystem takes care of creating for you. These are:

* ${PID} the current process ID.
* ${LOG\_FILE} if logging.file was set in Boot’s external configuration.
* ${LOG\_PATH} if logging.path was set (representing a directory for log files to live in).
* ${LOG\_EXCEPTION\_CONVERSION\_WORD} if logging.exception-conversion-word was set in Boot’s external configuration.

Spring Boot also provides some nice ANSI colour terminal output on a console (but not in a log file) using a custom Logback converter. See the default base.xml configuration for details.

If Groovy is on the classpath you should be able to configure Logback with logback.groovy as well (it will be given preference if present).

### Configure logback for file only output

If you want to disable console logging and write output only to a file you need a custom logback- spring.xml that imports file-appender.xml but not console-appender.xml:

<?xml version="1.0" encoding="UTF-8"?>

**<configuration>**

**<include resource**=**"org/springframework/boot/logging/logback/defaults.xml" />**

**<property name**=**"LOG\_FILE" value**=**"${LOG\_FILE:-${LOG\_PATH:-${LOG\_TEMP:-${java.io.tmpdir:-/ tmp}}/}spring.log}"/>**

**<include resource**=**"org/springframework/boot/logging/logback/file-appender.xml" />**

**<root level**=**"INFO">**

**<appender-ref ref**=**"FILE" />**

**</root>**

**</configuration>**

You also need to add logging.file to your application.properties:

**logging.file**=myapplication.log

## Configure Log4j for logging

Spring Boot supports [Log4j 2](http://logging.apache.org/log4j/2.x) for logging configuration if it is on the classpath. If you are using the starters for assembling dependencies that means you have to exclude Logback and then include log4j 2 instead. If you aren’t using the starters then you need to provide jcl-over-slf4j (at least) in addition to Log4j 2.

The simplest path is probably through the starters, even though it requires some jiggling with excludes, .e.g. in Maven:

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-web**</artifactId>**

**</dependency>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter**</artifactId>**

**<exclusions>**

**<exclusion>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-logging**</artifactId>**

**</exclusion>**

**</exclusions>**

**</dependency>**

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-log4j2**</artifactId>**

**</dependency>**

**Note**

The use of the Log4j starters gathers together the dependencies for common logging requirements (e.g. including having Tomcat use java.util.logging but configuring the output using Log4j 2). See the Actuator Log4j 2 samples for more detail and to see it in action.

### Use YAML or JSON to configure Log4j 2

In addition to its default XML configuration format, Log4j 2 also supports YAML and JSON configuration files. To configure Log4j 2 to use an alternative configuration file format, add the appropriate dependencies to the classpath and name your configuration files to match your chosen file format:

|  |  |  |
| --- | --- | --- |
| **Format** | **Dependencies** | **File names** |
| YAML | com.fasterxml.jackson.core:jackson-databind | log4j2.yam |
|  | com.fasterxml.jackson.dataformat:jackson-dataformat- | log4j2.yml |
|  | yaml |  |
| JSON | com.fasterxml.jackson.core:jackson-databind | log4j2.jso |
|  |  | log4j2.jsn |

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# Data Access

## Configure a custom DataSource

To configure your own DataSource define a @Bean of that type in your configuration. Spring Boot will reuse your DataSource anywhere one is required, including database initialization. If you need to externalize some settings, you can easily bind your DataSource to the environment (see [the section](#_bookmark110) [called “Third-party configuration”](#_bookmark110)).

@Bean @ConfigurationProperties(prefix="app.datasource") **public** DataSource dataSource() {

**return new** FancyDataSource();

}

**app.datasource.url**=jdbc:h2:mem:mydb **app.datasource.username**=sa **app.datasource.pool-size**=30

Assuming that your FancyDataSource has regular JavaBean properties for the url, the username and the pool size, these settings will be bound automatically before the DataSource is made available to other components. The regular [database initialization](#_bookmark520) will also happen (so the relevant sub-set of spring.datasource.\* can still be used with your custom configuration).

You can apply the same principle if you are configuring a custom JNDI DataSource:

@Bean(destroyMethod="") @ConfigurationProperties(prefix="app.datasource") **public** DataSource dataSource() **throws** Exception {

JndiDataSourceLookup dataSourceLookup = **new** JndiDataSourceLookup();

**return** dataSourceLookup.getDataSource(***"java:comp/env/jdbc/YourDS"***);

}

Spring Boot also provides a utility builder class DataSourceBuilder that can be used to create one of the standard data sources (if it is on the classpath). The builder can detect the one to use based on what’s available on the classpath. It also auto detects the driver based on the JDBC url.

@Bean @ConfigurationProperties("app.datasource") **public** DataSource dataSource() {

**return** DataSourceBuilder.create().build();

}

To run an app with that DataSource, all that is needed really is the connection information; pool- specific settings can also be provided, check the implementation that is going to be used at runtime for more details.

**app.datasource.url**=jdbc:mysql://localhost/test **app.datasource.username**=dbuser **app.datasource.password**=dbpass **app.datasource.pool-size**=30

There is a catch however. Because the actual type of the connection pool is not exposed, no keys are generated in the metadata for your custom DataSource and no completion is available in your IDE (The DataSource interface doesn’t expose any property). Also, if you happen to *only* have Hikari on the classpath, this basic setup will not work because Hikari has no url parameter (but a jdbcUrl parameter). You will have to rewrite your configuration as follows:

**app.datasource.jdbc-url**=jdbc:mysql://localhost/test **app.datasource.username**=dbuser **app.datasource.password**=dbpass **app.datasource.maximum-pool-size**=30

You can fix that by forcing the connection pool to use and return a dedicated implementation rather than DataSource. You won’t be able to change the implementation at runtime but the list of options will be explicit.

@Bean @ConfigurationProperties("app.datasource") **public** HikariDataSource dataSource() {

**return** (HikariDataSource) DataSourceBuilder.create()

.type(HikariDataSource.**class**).build();

}

You can even go further by leveraging what DataSourceProperties does for you, that is providing a default embedded database if no url is provided with a sensible username and password for it. You can easily initialize a DataSourceBuilder from the state of any DataSourceProperties so you could just as well inject the one Spring Boot creates automatically. However, that would split your configuration in two namespaces: url, username, password, type and driver on spring.datasource and the rest on your custom namespace (app.datasource). To avoid that, you can redefine a custom DataSourceProperties on your custom namespace:

@Bean @Primary

@ConfigurationProperties("app.datasource")

**public** DataSourceProperties dataSourceProperties() {

**return new** DataSourceProperties();

}

@Bean @ConfigurationProperties("app.datasource")

**public** HikariDataSource dataSource(DataSourceProperties properties) {

**return** (HikariDataSource) properties.initializeDataSourceBuilder()

.type(HikariDataSource.**class**).build();

}

This setup puts you *in pair* with what Spring Boot does for you by default, except that a dedicated connection pool is chosen (in code) and its settings are exposed in the same namespace. Because DataSourceProperties is taking care of the url/jdbcUrl translation for you, you can configure it like this:

**app.datasource.url**=jdbc:mysql://localhost/test **app.datasource.username**=dbuser **app.datasource.password**=dbpass **app.datasource.maximum-pool-size**=30

**Note**

Because your custom configuration chooses to go with Hikari, app.datasource.type will have no effect. In practice the builder will be initialized with whatever value you might set there and then overridden by the call to .type().

See [*Section 29.1, “Configure a DataSource”*](#_bookmark166)in the ‘Spring Boot features’ section and the

[DataSourceAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jdbc/DataSourceAutoConfiguration.java) class for more details.

## Configure Two DataSources

If you need to configure multiple data sources, you can apply the same tricks that are described in the previous section. You must, however, mark one of the DataSource @Primary as various auto- configurations down the road expect to be able to get one by type.

If you create your own DataSource, the auto-configuration will back off. In the example below, we provide the *exact* same features set than what the auto-configuration provides on the primary data source:

@Bean @Primary

@ConfigurationProperties("app.datasource.foo")

**public** DataSourceProperties fooDataSourceProperties() {

**return new** DataSourceProperties();

}

@Bean @Primary

@ConfigurationProperties("app.datasource.foo")

**public** DataSource fooDataSource() {

**return** fooDataSourceProperties().initializeDataSourceBuilder().build();

}

@Bean @ConfigurationProperties("app.datasource.bar") **public** BasicDataSource barDataSource() {

**return** (BasicDataSource) DataSourceBuilder.create()

.type(BasicDataSource.**class**).build();

}

**Tip**

fooDataSourceProperties has to be flagged @Primary so that the database initializer feature uses your copy (should you use that).

Both data sources are also bound for advanced customizations. For instance you could configure them as follows:

**app.datasource.foo.type**=com.zaxxer.hikari.HikariDataSource **app.datasource.foo.maximum-pool-size**=30

**app.datasource.bar.url**=jdbc:mysql://localhost/test **app.datasource.bar.username**=dbuser **app.datasource.bar.password**=dbpass **app.datasource.bar.max-total**=30

Of course, you can apply the same concept to the secondary DataSource as well:

@Bean @Primary

@ConfigurationProperties("app.datasource.foo")

**public** DataSourceProperties fooDataSourceProperties() {

**return new** DataSourceProperties();

}

@Bean @Primary

@ConfigurationProperties("app.datasource.foo")

**public** DataSource fooDataSource() {

**return** fooDataSourceProperties().initializeDataSourceBuilder().build();

}

@Bean @ConfigurationProperties("app.datasource.bar")

**public** DataSourceProperties barDataSourceProperties() {

**return new** DataSourceProperties();

}

@Bean @ConfigurationProperties("app.datasource.bar") **public** DataSource barDataSource() {

**return** barDataSourceProperties().initializeDataSourceBuilder().build();

}

This final example configures two data sources on custom namespaces with the same logic than what Spring Boot would do in auto-configuration.

## Use Spring Data repositories

Spring Data can create implementations for you of @Repository interfaces of various flavors. Spring Boot will handle all of that for you as long as those @Repositories are included in the same package (or a sub-package) of your @EnableAutoConfiguration class.

For many applications all you will need is to put the right Spring Data dependencies on your classpath (there is a spring-boot-starter-data-jpa for JPA and a spring-boot-starter-data- mongodb for Mongodb), create some repository interfaces to handle your @Entity objects. Examples are in the [JPA sample](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-data-jpa) or the [Mongodb sample](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-data-mongodb).

Spring Boot tries to guess the location of your @Repository definitions, based on the @EnableAutoConfiguration it finds. To get more control, use the @EnableJpaRepositories annotation (from Spring Data JPA).

## Separate @Entity definitions from Spring configuration

Spring Boot tries to guess the location of your @Entity definitions, based on the @EnableAutoConfiguration it finds. To get more control, you can use the @EntityScan annotation, e.g.

@Configuration @EnableAutoConfiguration

@EntityScan(basePackageClasses=City.class)

**public class** Application {

*//...*

}

## Configure JPA properties

Spring Data JPA already provides some vendor-independent configuration options (e.g. for SQL logging) and Spring Boot exposes those, and a few more for hibernate as external configuration properties. Some of them are automatically detected according to the context so you shouldn’t have to set them.

The spring.jpa.hibernate.ddl-auto is a special case in that it has different defaults depending on whether you are using an embedded database (create-drop) or not (none). The dialect to use is also automatically detected based on the current DataSource but you can set spring.jpa.database yourself if you want to be explicit and bypass that check on startup.

**Note**

Specifying a database leads to the configuration of a well-defined Hibernate dialect. Several databases have more than one Dialect and this may not suit your need. In that case, you can either set spring.jpa.database to default to let Hibernate figure things out or set the dialect using the spring.jpa.database-platform property.

The most common options to set are:

spring.jpa.hibernate.naming.physical-strategy=com.example.MyPhysicalNamingStrategy spring.jpa.show-sql=true

In addition all properties in spring.jpa.properties.\* are passed through as normal JPA properties (with the prefix stripped) when the local EntityManagerFactory is created.

## Configure Hibernate Naming Strategy

Spring Boot provides a consistent naming strategy regardless of the Hibernate generation that you are using. If you are using Hibernate 4, you can customize it using spring.jpa.hibernate.naming.strategy; Hibernate 5 defines a Physical and Implicit naming strategies.

Spring Boot configures SpringPhysicalNamingStrategy by default. This implementation provides the same table structure as Hibernate 4: all dots are replaced by underscores and camel cases are replaced by underscores as well. By default, all table names are generated in lower case but it is possible to override that flag if your schema requires it.

Concretely, a TelephoneNumber entity will be mapped to the telephone\_number table. If you’d rather use Hibernate 5’s default instead, set the following property:

spring.jpa.hibernate.naming.physical- strategy=org.hibernate.boot.model.naming.PhysicalNamingStrategyStandardImpl

See [HibernateJpaAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/orm/jpa/HibernateJpaAutoConfiguration.java) and [JpaBaseConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/orm/jpa/JpaBaseConfiguration.java) for more details.

## Use a custom EntityManagerFactory

To take full control of the configuration of the EntityManagerFactory, you need to add a @Bean named ‘entityManagerFactory’. Spring Boot auto-configuration switches off its entity manager based on the presence of a bean of that type.

## Use Two EntityManagers

Even if the default EntityManagerFactory works fine, you will need to define a new one because otherwise the presence of the second bean of that type will switch off the default. To make it easy to do that you can use the convenient EntityManagerBuilder provided by Spring Boot, or if you prefer you can just use the LocalContainerEntityManagerFactoryBean directly from Spring ORM.

Example:

*// add two data sources configured as above*

@Bean

**public** LocalContainerEntityManagerFactoryBean customerEntityManagerFactory(

EntityManagerFactoryBuilder builder) {

**return** builder

.dataSource(customerDataSource())

.packages(Customer.**class**)

.persistenceUnit(***"customers"***)

.build();

}

@Bean

**public** LocalContainerEntityManagerFactoryBean orderEntityManagerFactory( EntityManagerFactoryBuilder builder) {

**return** builder

.dataSource(orderDataSource())

.packages(Order.**class**)

.persistenceUnit(***"orders"***)

.build();

}

The configuration above almost works on its own. To complete the picture you need to configure TransactionManagers for the two EntityManagers as well. One of them could be picked up by the default JpaTransactionManager in Spring Boot if you mark it as @Primary. The other would have to be explicitly injected into a new instance. Or you might be able to use a JTA transaction manager spanning both.

If you are using Spring Data, you need to configure @EnableJpaRepositories accordingly:

@Configuration

@EnableJpaRepositories(basePackageClasses = Customer.class, entityManagerFactoryRef = "customerEntityManagerFactory")

**public class** CustomerConfiguration {

...

}

@Configuration

@EnableJpaRepositories(basePackageClasses = Order.class, entityManagerFactoryRef = "orderEntityManagerFactory")

**public class** OrderConfiguration {

...

}

## Use a traditional persistence.xml

Spring doesn’t require the use of XML to configure the JPA provider, and Spring Boot assumes you want to take advantage of that feature. If you prefer to use persistence.xml then you need to define your own @Bean of type LocalEntityManagerFactoryBean (with id ‘entityManagerFactory’, and set the persistence unit name there.

See [JpaBaseConfiguration](https://github.com/spring-projects/spring-boot/blob/master/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/orm/jpa/JpaBaseConfiguration.java) for the default settings.

## Use Spring Data JPA and Mongo repositories

Spring Data JPA and Spring Data Mongo can both create Repository implementations for you automatically. If they are both present on the classpath, you might have to do some extra configuration to tell Spring Boot which one (or both) you want to create repositories for you. The most explicit way to do that is to use the standard Spring Data @Enable\*Repositories and tell it the location of your Repository interfaces (where ‘\*’ is ‘Jpa’ or ‘Mongo’ or both).

There are also flags spring.data.\*.repositories.enabled that you can use to switch the auto- configured repositories on and off in external configuration. This is useful for instance in case you want to switch off the Mongo repositories and still use the auto-configured MongoTemplate.

The same obstacle and the same features exist for other auto-configured Spring Data repository types (Elasticsearch, Solr). Just change the names of the annotations and flags respectively.

## Expose Spring Data repositories as REST endpoint

Spring Data REST can expose the Repository implementations as REST endpoints for you as long as Spring MVC has been enabled for the application.

Spring Boot exposes a set of useful properties from the spring.data.rest namespace that customize the [RepositoryRestConfiguration](http://docs.spring.io/spring-data/rest/docs/current/api/org/springframework/data/rest/core/config/RepositoryRestConfiguration.html). If you need to provide additional customization, you should use a [RepositoryRestConfigurer](http://docs.spring.io/spring-data/rest/docs/current/api/org/springframework/data/rest/webmvc/config/RepositoryRestConfigurer.html) bean.

**Note**

If you don’t specify any order on your custom RepositoryRestConfigurer it will run after the one Spring Boot uses internally. If you need to specify an order, make sure it is higher than 0.

## Configure a component that is used by JPA

If you want to configure a component that will be used by JPA then you need to ensure that the component is initialized before JPA. Where the component is auto-configured Spring Boot will take care of this for you. For example, when Flyway is auto-configured, Hibernate is configured to depend upon Flyway so that the latter has a chance to initialize the database before Hibernate tries to use it.

If you are configuring a component yourself, you can use an EntityManagerFactoryDependsOnPostProcessor subclass as a convenient way of setting up the necessary dependencies. For example, if you are using Hibernate Search with Elasticsearch as its index manager then any EntityManagerFactory beans must be configured to depend on the elasticsearchClient bean:

**/\*\***

* **{@link EntityManagerFactoryDependsOnPostProcessor} that ensures that**
* **{@link EntityManagerFactory} beans depend on the {@code elasticsearchClient} bean.**

**\*/**

@Configuration

**static class** ElasticsearchJpaDependencyConfiguration

**extends** EntityManagerFactoryDependsOnPostProcessor {

ElasticsearchJpaDependencyConfiguration() {

**super**(***"elasticsearchClient"***);

}

}

# Database initialization

An SQL database can be initialized in different ways depending on what your stack is. Or of course you can do it manually as long as the database is a separate process.

## Initialize a database using JPA

JPA has features for DDL generation, and these can be set up to run on startup against the database. This is controlled through two external properties:

* spring.jpa.generate-ddl (boolean) switches the feature on and off and is vendor independent.
* spring.jpa.hibernate.ddl-auto (enum) is a Hibernate feature that controls the behavior in a more fine-grained way. See below for more detail.

## Initialize a database using Hibernate

You can set spring.jpa.hibernate.ddl-auto explicitly and the standard Hibernate property values are none, validate, update, create, create-drop. Spring Boot chooses a default value for you based on whether it thinks your database is embedded (default create-drop) or not (default none). An embedded database is detected by looking at the Connection type: hsqldb, h2 and derby are embedded, the rest are not. Be careful when switching from in-memory to a ‘real’ database that you don’t make assumptions about the existence of the tables and data in the new platform. You either have to set ddl-auto explicitly, or use one of the other mechanisms to initialize the database.

**Note**

You can output the schema creation by enabling the org.hibernate.SQL logger. This is done for you automatically if you enable the [debug mode](#_bookmark121).

In addition, a file named import.sql in the root of the classpath will be executed on startup if Hibernate creates the schema from scratch (that is if the ddl-auto property is set to create or create-drop). This can be useful for demos and for testing if you are careful, but probably not something you want to be on the classpath in production. It is a Hibernate feature (nothing to do with Spring).

## Initialize a database

Spring Boot can automatically create the schema (DDL scripts) of your DataSource and initialize it (DML scripts): it loads SQL from the standard root classpath locations schema.sql and data.sql, respectively. In addition Spring Boot will process the schema-

${platform}.sql and data-${platform}.sql files (if present), where platform is the value of

spring.datasource.platform. This allows you to switch to database specific scripts if necessary,

e.g. you might choose to set it to the vendor name of the database (hsqldb, h2, oracle, mysql, postgresql etc.).

Spring Boot enables the fail-fast feature of the Spring JDBC initializer by default, so if the scripts cause exceptions the application will fail to start. You can tune that using spring.datasource.continue- on-error.

**Note**

In a JPA-based app, you can choose to let Hibernate create the schema or use schema.sql but not both. Make sure to disable spring.jpa.hibernate.ddl-auto if you chose the later.

You can also disable initialization by setting spring.datasource.initialize to false.

## Initialize a Spring Batch database

If you are using Spring Batch then it comes pre-packaged with SQL initialization scripts for most popular database platforms. Spring Boot will detect your database type, and execute those scripts by default, and in this case will switch the fail fast setting to false (errors are logged but do not prevent the application from starting). This is because the scripts are known to be reliable and generally do not contain bugs, so errors are ignorable, and ignoring them makes the scripts idempotent. You can switch off the initialization explicitly using spring.batch.initializer.enabled=false.

## Use a higher-level database migration tool

Spring Boot supports two higher-level migration tools: [Flyway](http://flywaydb.org/) and [Liquibase](http://www.liquibase.org/).

### Execute Flyway database migrations on startup

To automatically run Flyway database migrations on startup, add the org.flywaydb:flyway-core

to your classpath.

The migrations are scripts in the form V<VERSION> <NAME>.sql (with <VERSION> an underscore- separated version, e.g. ‘1’ or ‘2\_1’). By default they live in a folder classpath:db/migration but you can modify that using flyway.locations. You can also add a special {vendor} placeholder to use vendor-specific scripts. Assume the following:

**flyway.locations**=db/migration/{vendor}

Rather than using db/migration, this configuration will set the folder to use according to the type of the database (i.e. db/migration/mysql for MySQL). The list of supported database are available in [DatabaseDriver](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/jdbc/DatabaseDriver.java).

See also the Flyway class from flyway-core for details of available settings like schemas etc. In addition Spring Boot provides a small set of properties in [FlywayProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/flyway/FlywayProperties.java) that can be used to disable the migrations, or switch off the location checking. Spring Boot will call Flyway.migrate() to perform the database migration. If you would like more control, provide a @Bean that implements [FlywayMigrationStrategy](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/flyway/FlywayMigrationStrategy.java).

**Tip**

If you want to make use of [Flyway callbacks](http://flywaydb.org/documentation/callbacks.html), those scripts should also live in the classpath:db/ migration folder.

By default Flyway will autowire the (@Primary) DataSource in your context and use that for migrations. If you like to use a different DataSource you can create one and mark its @Bean as @FlywayDataSource - if you do that remember to create another one and mark it as @Primary if you want two data sources. Or you can use Flyway’s native DataSource by setting flyway. [url,user,password] in external properties.

There is a [Flyway sample](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-flyway) so you can see how to set things up.

You can also use Flyway to provide data for specific scenarios. For example, you can place test- specific migrations in src/test/resources and they will only be run when your application starts for testing. If you want to be more sophisticated you can use profile-specific configuration to customize flyway.locations so that certain migrations will only run when a particular profile is active. For example, in application-dev.properties you could set flyway.locations to classpath:/ db/migration, classpath:/dev/db/migration and migrations in dev/db/migration will only run when the dev profile is active.

### Execute Liquibase database migrations on startup

To automatically run Liquibase database migrations on startup, add the

org.liquibase:liquibase-core to your classpath.

The master change log is by default read from db/changelog/db.changelog-master.yaml but can be set using liquibase.change-log. In addition to YAML, Liquibase also supports JSON, XML, and SQL change log formats.

By default Liquibase will autowire the (@Primary) DataSource in your context and use that for migrations. If you like to use a different DataSource you can create one and mark its @Bean as @LiquibaseDataSource - if you do that remember to create another one and mark it as @Primary if you want two data sources. Or you can use Liquibase’s native DataSource by setting liquibase. [url,user,password] in external properties.

See [LiquibaseProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/liquibase/LiquibaseProperties.java) for details of available settings like contexts, default schema etc. There is a [Liquibase sample](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-liquibase) so you can see how to set things up.

# Messaging

## Disable transacted JMS session

If your JMS broker does not support transacted session, you will have to disable the support of transactions altogether. If you create your own JmsListenerContainerFactory there is nothing to do since it won’t be transacted by default. If you want to use the DefaultJmsListenerContainerFactoryConfigurer to reuse Spring Boot’s default, you can disable transacted session as follows:

@Bean

**public** DefaultJmsListenerContainerFactory jmsListenerContainerFactory( ConnectionFactory connectionFactory, DefaultJmsListenerContainerFactoryConfigurer configurer) {

DefaultJmsListenerContainerFactory listenerFactory =

**new** DefaultJmsListenerContainerFactory(); configurer.configure(listenerFactory, connectionFactory); listenerFactory.setTransactionManager(null); listenerFactory.setSessionTransacted(false);

**return** listenerFactory;

}

This overrides the default factory and this should be applied to any other factory that your application defines, if any.

# Batch applications

**Note**

By default, batch applications require a DataSource to store job details. If you want to deviate from that, you’ll need to implement BatchConfigurer, see [The Javadoc of](http://docs.spring.io/spring-batch/apidocs/org/springframework/batch/core/configuration/annotation/EnableBatchProcessing.html) [@EnableBatchProcessing](http://docs.spring.io/spring-batch/apidocs/org/springframework/batch/core/configuration/annotation/EnableBatchProcessing.html) for more details.

## Execute Spring Batch jobs on startup

Spring Batch auto-configuration is enabled by adding @EnableBatchProcessing (from Spring Batch) somewhere in your context.

By default it executes **all** Jobs in the application context on startup (see [JobLauncherCommandLineRunner](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/batch/JobLauncherCommandLineRunner.java) for details). You can narrow down to a specific job or jobs by specifying spring.batch.job.names (comma-separated job name patterns).

If the application context includes a JobRegistry then the jobs in spring.batch.job.names are looked up in the registry instead of being autowired from the context. This is a common pattern with more complex systems where multiple jobs are defined in child contexts and registered centrally.

See [BatchAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/batch/BatchAutoConfiguration.java) and [@EnableBatchProcessing](https://github.com/spring-projects/spring-batch/blob/master/spring-batch-core/src/main/java/org/springframework/batch/core/configuration/annotation/EnableBatchProcessing.java) for more details.

# Actuator

## Change the HTTP port or address of the actuator endpoints

In a standalone application the Actuator HTTP port defaults to the same as the main HTTP port. To make the application listen on a different port set the external property management.port. To listen on a completely different network address (e.g. if you have an internal network for management and an external one for user applications) you can also set management.address to a valid IP address that the server is able to bind to.

For more detail look at the [ManagementServerProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/ManagementServerProperties.java) source code and [*Section 48.3,*](#_bookmark317)[*“Customizing the management server port”*](#_bookmark317) in the ‘Production-ready features’ section.

## Customize the ‘whitelabel’ error page

Spring Boot installs a ‘whitelabel’ error page that you will see in browser client if you encounter a server error (machine clients consuming JSON and other media types should see a sensible response with the right error code).

**Note**

Set server.error.whitelabel.enabled=false to switch the default error page off which will restore the default of the servlet container that you are using. Note that Spring Boot will still attempt to resolve the error view so you’d probably add you own error page rather than disabling it completely.

Overriding the error page with your own depends on the templating technology that you are using. For example, if you are using Thymeleaf you would add an error.html template and if you are using FreeMarker you would add an error.ftl template. In general what you need is a View that resolves with a name of error, and/or a @Controller that handles the /error path. Unless you replaced some of the default configuration you should find a BeanNameViewResolver in your ApplicationContext so a @Bean with id error would be a simple way of doing that. Look at [ErrorMvcAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/ErrorMvcAutoConfiguration.java) for more options.

See also the section on [Error Handling](#_bookmark139) for details of how to register handlers in the servlet container.

## Actuator and Jersey

Actuator HTTP endpoints are only available for Spring MVC-based applications. If you want to use Jersey and still use the actuator you will need to enable Spring MVC (by depending on spring- boot-starter-web, for example). By default, both Jersey and the Spring MVC dispatcher servlet are mapped to the same path (/). You will need to change the path for one of them (by configuring server.servlet-path for Spring MVC or spring.jersey.application-path for Jersey). For example, if you add server.servlet-path=/system into application.properties, the actuator HTTP endpoints will be available under /system.

# Security

## Switch off the Spring Boot security configuration

If you define a @Configuration with @EnableWebSecurity anywhere in your application it will switch off the default webapp security settings in Spring Boot (but leave the Actuator’s security enabled). To tweak the defaults try setting properties in security.\* (see [SecurityProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/security/SecurityProperties.java) for details of available settings) and SECURITY section of [Common application properties](#_bookmark570).

## Change the AuthenticationManager and add user accounts

If you provide a @Bean of type AuthenticationManager the default one will not be created, so you have the full feature set of Spring Security available (e.g. [various authentication options](http://docs.spring.io/spring-security/site/docs/current/reference/htmlsingle/#jc-authentication)).

Spring Security also provides a convenient AuthenticationManagerBuilder which can be used to build an AuthenticationManager with common options. The recommended way to use this in a webapp is to inject it into a void method in a WebSecurityConfigurerAdapter, e.g.

@Configuration

**public class** SecurityConfiguration **extends** WebSecurityConfigurerAdapter {

@Autowired

**public void** configureGlobal(AuthenticationManagerBuilder auth) **throws** Exception { auth.inMemoryAuthentication()

.withUser(***"barry"***).password(***"password"***).roles(***"USER"***); *// ... etc.*

}

*// ... other stuff for application security*

}

You will get the best results if you put this in a nested class, or a standalone class (i.e. not mixed in with a lot of other @Beans that might be allowed to influence the order of instantiation). The [secure web](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-web-secure) [sample](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-web-secure) is a useful template to follow.

If you experience instantiation issues (e.g. using JDBC or JPA for the user detail store) it might be worth extracting the AuthenticationManagerBuilder callback into a GlobalAuthenticationConfigurerAdapter (in the init() method so it happens before the authentication manager is needed elsewhere), e.g.

@Configuration

**public class** AuthenticationManagerConfiguration **extends**

GlobalAuthenticationConfigurerAdapter {

@Override

**public void** init(AuthenticationManagerBuilder auth) { auth.inMemoryAuthentication() *// ... etc.*

}

}

## Enable HTTPS when running behind a proxy server

Ensuring that all your main endpoints are only available over HTTPS is an important chore for any application. If you are using Tomcat as a servlet container, then Spring Boot will add Tomcat’s own

RemoteIpValve automatically if it detects some environment settings, and you should be able to rely on the HttpServletRequest to report whether it is secure or not (even downstream of a proxy server that handles the real SSL termination). The standard behavior is determined by the presence or absence of certain request headers (x-forwarded-for and x-forwarded-proto), whose names are conventional, so it should work with most front end proxies. You can switch on the valve by adding some entries to application.properties, e.g.

**server.tomcat.remote-ip-header**=x-forwarded-for **server.tomcat.protocol-header**=x-forwarded-proto

(The presence of either of those properties will switch on the valve. Or you can add the RemoteIpValve

yourself by adding a TomcatEmbeddedServletContainerFactory bean.)

Spring Security can also be configured to require a secure channel for all (or some requests). To switch that on in a Spring Boot application you just need to set security.require\_ssl to true in application.properties.

# Hot swapping

## Reload static content

There are several options for hot reloading. The recommended approach is to use [spring-boot-](#_bookmark67) [devtools](#_bookmark67) as it provides additional development-time features such as support for fast application restarts and LiveReload as well as sensible development-time configuration (e.g. template caching). Devtools works by monitoring the classpath for changes. This means that static resource changes must be "built" for the change to take affect. By default, this happens automatically in Eclipse when you save your changes. In IntelliJ IDEA, Make Project will trigger the necessary build. Due to the [default restart](#_bookmark71) [exclusions](#_bookmark71), changes to static resources will not trigger a restart of your application. They will, however, trigger a live reload.

Alternatively, running in an IDE (especially with debugging on) is a good way to do development (all modern IDEs allow reloading of static resources and usually also hot-swapping of Java class changes).

Finally, the [Maven and Gradle plugins](#_bookmark407) can be configured (see the addResources property) to support running from the command line with reloading of static files directly from source. You can use that with an external css/js compiler process if you are writing that code with higher level tools.

## Reload templates without restarting the container

Most of the templating technologies supported by Spring Boot include a configuration option to disable caching (see below for details). If you’re using the spring-boot-devtools module these properties will be [automatically configured](#_bookmark68) for you at development time.

### Thymeleaf templates

If you are using Thymeleaf, then set spring.thymeleaf.cache to false. See

[ThymeleafAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/thymeleaf/ThymeleafAutoConfiguration.java) for other Thymeleaf customization options.

### FreeMarker templates

If you are using FreeMarker, then set spring.freemarker.cache to false. See

[FreeMarkerAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/freemarker/FreeMarkerAutoConfiguration.java) for other FreeMarker customization options.

### Groovy templates

If you are using Groovy templates, then set spring.groovy.template.cache to false. See

[GroovyTemplateAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/groovy/template/GroovyTemplateAutoConfiguration.java) for other Groovy customization options.

## Fast application restarts

The spring-boot-devtools module includes support for automatic application restarts. Whilst not as fast as technologies such as [JRebel](http://zeroturnaround.com/software/jrebel/) or [Spring Loaded](https://github.com/spring-projects/spring-loaded) it’s usually significantly faster than a “cold start”. You should probably give it a try before investigating some of the more complex reload options discussed below.

For more details see the [Chapter 20, *Developer tools*](#_bookmark67) section.

## Reload Java classes without restarting the container

Modern IDEs (Eclipse, IDEA, etc.) all support hot swapping of bytecode, so if you make a change that doesn’t affect class or method signatures it should reload cleanly with no side effects.

[Spring Loaded](https://github.com/spring-projects/spring-loaded) goes a little further in that it can reload class definitions with changes in the method signatures. With some customization it can force an ApplicationContext to refresh itself (but there is no general mechanism to ensure that would be safe for a running application anyway, so it would only ever be a development time trick probably).

### Configuring Spring Loaded for use with Maven

To use Spring Loaded with the Maven command line, just add it as a dependency in the Spring Boot plugin declaration, e.g.

**<plugin>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-maven-plugin**</artifactId>**

**<dependencies>**

**<dependency>**

**<groupId>**org.springframework**</groupId>**

**<artifactId>**springloaded**</artifactId>**

**<version>**1.2.6.RELEASE**</version>**

**</dependency>**

**</dependencies>**

**</plugin>**

This normally works pretty well with Eclipse and IntelliJ IDEA as long as they have their build configuration aligned with the Maven defaults (Eclipse m2e does this out of the box).

### Configuring Spring Loaded for use with Gradle and IntelliJ IDEA

You need to jump through a few hoops if you want to use Spring Loaded in combination with Gradle and IntelliJ IDEA. By default, IntelliJ IDEA will compile classes into a different location than Gradle, causing Spring Loaded monitoring to fail.

To configure IntelliJ IDEA correctly you can use the idea Gradle plugin:

buildscript {

repositories { jcenter() } dependencies {

classpath ***"org.springframework.boot:spring-boot-gradle-plugin:1.5.8.RELEASE"***

classpath ***'org.springframework:springloaded:1.2.6.RELEASE'***

}

}

apply plugin: ***'idea'***

idea {

module {

inheritOutputDirs = false

outputDir = file(***"$buildDir/classes/main/"***)

}

}

*// ...*

**Note**

IntelliJ IDEA must be configured to use the same Java version as the command line Gradle task and springloaded **must** be included as a buildscript dependency.

You can also additionally enable ‘Make Project Automatically’ inside IntelliJ IDEA to automatically compile your code whenever a file is saved.

# Build

## Generate build information

Both the Maven and Gradle plugin allow to generate build information containing the coordinates, name and version of the project. The plugin can also be configured to add additional properties through configuration. When such file is present, Spring Boot auto-configures a BuildProperties bean.

To generate build information with Maven, add an execution for the build-info goal:

**<build>**

**<plugins>**

**<plugin>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-maven-plugin**</artifactId>**

**<version>**1.5.8.RELEASE**</version>**

**<executions>**

**<execution>**

**<goals>**

**<goal>**build-info**</goal>**

**</goals>**

**</execution>**

**</executions>**

**</plugin>**

**</plugins>**

**</build>**

**Tip**

Check the [Spring Boot Maven Plugin documentation](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/maven-plugin/) for more details. And to do the same with Gradle:

springBoot {

buildInfo()

}

Additional properties can be added using the DSL:

springBoot {

buildInfo {

additionalProperties = [

***'foo'***: ***'bar'***

]

}

}

## Generate git information

Both Maven and Gradle allow to generate a git.properties file containing information about the state of your git source code repository when the project was built.

For Maven users the spring-boot-starter-parent POM includes a pre-configured plugin to generate a git.properties file. Simply add the following declaration to your POM:

**<build>**

**<plugins>**

**<plugin>**

**<groupId>**pl.project13.maven**</groupId>**

**<artifactId>**git-commit-id-plugin**</artifactId>**

**</plugin>**

**</plugins>**

**</build>**

Gradle users can achieve the same result using the [gradle-git-properties](https://plugins.gradle.org/plugin/com.gorylenko.gradle-git-properties) plugin

plugins {

id ***"com.gorylenko.gradle-git-properties"*** version ***"1.4.17"***

}

**Tip**

The commit time in git.properties is expected to match the format yyyy-MM- dd’T’HH:mm:ssZ. This is the default format for both plugins listed above. Using this format allows the time to be parsed into a Date and its format when serialized to JSON to be controlled by Jackson’s date serialization configuration settings.

## Customize dependency versions

If you use a Maven build that inherits directly or indirectly from spring-boot-dependencies (for instance spring-boot-starter-parent) but you want to override a specific third-party dependency you can add appropriate <properties> elements. Browse the [spring-boot-dependencies](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-dependencies/pom.xml) POM for a complete list of properties. For example, to pick a different slf4j version you would add the following:

**<properties>**

**<slf4j.version>**1.7.5**<slf4j.version>**

**</properties>**

**Note**

This only works if your Maven project inherits (directly or indirectly) from spring- boot-dependencies. If you have added spring-boot-dependencies in your own dependencyManagement section with <scope>import</scope> you have to redefine the artifact yourself instead of overriding the property.

**Warning**

Each Spring Boot release is designed and tested against a specific set of third-party dependencies. Overriding versions may cause compatibility issues.

To override dependency versions in Gradle, you can specify a version as shown below:

ext[***'slf4j.version'***] = ***'1.7.5'***

For additional information, please refer to the [Gradle Dependency Management Plugin documentation](https://github.com/spring-gradle-plugins/dependency-management-plugin).

## Create an executable JAR with Maven

The spring-boot-maven-plugin can be used to create an executable ‘fat’ JAR. If you are using the spring-boot-starter-parent POM you can simply declare the plugin and your jars will be repackaged:

**<build>**

**<plugins>**

**<plugin>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-maven-plugin**</artifactId>**

**</plugin>**

**</plugins>**

**</build>**

If you are not using the parent POM you can still use the plugin, however, you must additionally add an <executions> section:

**<build>**

**<plugins>**

**<plugin>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-maven-plugin**</artifactId>**

**<version>**1.5.8.RELEASE**</version>**

**<executions>**

**<execution>**

**<goals>**

**<goal>**repackage**</goal>**

**</goals>**

**</execution>**

**</executions>**

**</plugin>**

**</plugins>**

**</build>**

See the [plugin documentation](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/maven-plugin/usage.html) for full usage details.

## Use a Spring Boot application as a dependency

Like a war file, a Spring Boot application is not intended to be used as a dependency. If your application contains classes that you want to share with other projects, the recommended approach is to move that code into a separate module. The separate module can then be depended upon by your application and other projects.

If you cannot rearrange your code as recommended above, Spring Boot’s Maven and Gradle plugins must be configured to produce a separate artifact that is suitable for use as a dependency. The executable archive cannot be used as a dependency as the [executable jar format](#_bookmark595) packages application classes in BOOT-INF/classes. This means that they cannot be found when the executable jar is used as a dependency.

To produce the two artifacts, one that can be used as a dependency and one that is executable, a classifier must be specified. This classifier is applied to the name of the executable archive, leaving the default archive for use as dependency.

To configure a classifier of exec in Maven, the following configuration can be used:

**<build>**

**<plugins>**

**<plugin>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-maven-plugin**</artifactId>**

**<configuration>**

**<classifier>**exec**</classifier>**

**</configuration>**

**</plugin>**

**</plugins>**

**</build>**

And when using Gradle, the following configuration can be used:

bootRepackage { classifier = ***'exec'***

}

## Extract specific libraries when an executable jar runs

Most nested libraries in an executable jar do not need to be unpacked in order to run, however, certain libraries can have problems. For example, JRuby includes its own nested jar support which assumes that the jruby-complete.jar is always directly available as a file in its own right.

To deal with any problematic libraries, you can flag that specific nested jars should be automatically unpacked to the ‘temp folder’ when the executable jar first runs.

For example, to indicate that JRuby should be flagged for unpack using the Maven Plugin you would add the following configuration:

**<build>**

**<plugins>**

**<plugin>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-maven-plugin**</artifactId>**

**<configuration>**

**<requiresUnpack>**

**<dependency>**

**<groupId>**org.jruby**</groupId>**

**<artifactId>**jruby-complete**</artifactId>**

**</dependency>**

**</requiresUnpack>**

**</configuration>**

**</plugin>**

**</plugins>**

**</build>**

And to do that same with Gradle:

springBoot {

requiresUnpack = [***'org.jruby:jruby-complete'***]

}

## Create a non-executable JAR with exclusions

Often if you have an executable and a non-executable jar as build products, the executable version will have additional configuration files that are not needed in a library jar. E.g. the application.yml configuration file might excluded from the non-executable JAR.

Here’s how to do that in Maven:

**<build>**

**<plugins>**

**<plugin>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-maven-plugin**</artifactId>**

**<configuration>**

**<classifier>**exec**</classifier>**

**</configuration>**

**</plugin>**

**<plugin>**

**<artifactId>**maven-jar-plugin**</artifactId>**

**<executions>**

**<execution>**

**<id>**exec**</id>**

**<phase>**package**</phase>**

**<goals>**

**<goal>**jar**</goal>**

**</goals>**

**<configuration>**

**<classifier>**exec**</classifier>**

**</configuration>**

**</execution>**

**<execution>**

**<phase>**package**</phase>**

**<goals>**

**<goal>**jar**</goal>**

**</goals>**

**<configuration>**

*<!-- Need this to ensure application.yml is excluded -->*

**<forceCreation>**true**</forceCreation>**

**<excludes>**

**<exclude>**application.yml**</exclude>**

**</excludes>**

**</configuration>**

**</execution>**

**</executions>**

**</plugin>**

**</plugins>**

**</build>**

In Gradle you can create a new JAR archive with standard task DSL features, and then have the

bootRepackage task depend on that one using its withJarTask property:

jar {

baseName = ***'spring-boot-sample-profile'***

version = ***'0.0.0'***

excludes = [***'\*\*/application.yml'***]

}

task(***'execJar'***, type:Jar, dependsOn: ***'jar'***) { baseName = ***'spring-boot-sample-profile'*** version = ***'0.0.0'***

classifier = ***'exec'***

from sourceSets.main.output

}

bootRepackage {

withJarTask = tasks[***'execJar'***]

}

## Remote debug a Spring Boot application started with Maven

To attach a remote debugger to a Spring Boot application started with Maven you can use the

jvmArguments property of the [maven plugin](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/maven-plugin/). Check [this example](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/maven-plugin/examples/run-debug.html) for more details.

## Remote debug a Spring Boot application started with Gradle

To attach a remote debugger to a Spring Boot application started with Gradle you can use the jvmArgs

property of bootRun task or --debug-jvm command line option.

build.gradle:

bootRun {

jvmArgs ***"-agentlib:jdwp=transport=dt\_socket,server=y,suspend=y,address=5005"***

}

Command line:

$ gradle bootRun --debug-jvm

Check [Gradle Application Plugin](http://www.gradle.org/docs/current/userguide/application_plugin.html) for more details.

## Build an executable archive from Ant without using spring-boot-antlib

To build with Ant you need to grab dependencies, compile and then create a jar or war archive. To make it executable you can either use the spring-boot-antlib module, or you can follow these instructions:

1. If you are building a jar, package the application’s classes and resources in a nested BOOT-INF/ classes directory. If you are building a war, package the application’s classes in a nested WEB- INF/classes directory as usual.
2. Add the runtime dependencies in a nested BOOT-INF/lib directory for a jar or WEB-INF/lib for a war. Remember **not** to compress the entries in the archive.
3. Add the provided (embedded container) dependencies in a nested BOOT-INF/lib directory for jar or WEB-INF/lib-provided for a war. Remember **not** to compress the entries in the archive.
4. Add the spring-boot-loader classes at the root of the archive (so the Main-Class is available).
5. Use the appropriate launcher, e.g. JarLauncher for a jar file, as a Main-Class attribute in the manifest and specify the other properties it needs as manifest entries, principally a Start-Class.

Example:

**<target name**=**"build" depends**=**"compile">**

**<jar destfile**=**"target/${ant.project.name}-${spring-boot.version}.jar" compress**=**"false">**

**<mappedresources>**

**<fileset dir**=**"target/classes" />**

**<globmapper from**=**"\*" to**=**"BOOT-INF/classes/\*"/>**

**</mappedresources>**

**<mappedresources>**

**<fileset dir**=**"src/main/resources" erroronmissingdir**=**"false"/>**

**<globmapper from**=**"\*" to**=**"BOOT-INF/classes/\*"/>**

**</mappedresources>**

**<mappedresources>**

**<fileset dir**=**"${lib.dir}/runtime" />**

**<globmapper from**=**"\*" to**=**"BOOT-INF/lib/\*"/>**

**</mappedresources>**

**<zipfileset src**=**"${lib.dir}/loader/spring-boot-loader-jar-${spring-boot.version}.jar" />**

**<manifest>**

**<attribute name**=**"Main-Class" value**=**"org.springframework.boot.loader.JarLauncher" />**

**<attribute name**=**"Start-Class" value**=**"${start-class}" />**

**</manifest>**

**</jar>**

**</target>**

The [Ant Sample](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-ant) has a build.xml with a manual task that should work if you run it with

$ ant -lib <folder containing ivy-2.2.jar> clean manual

after which you can run the application with

$ java -jar target/\*.jar

## How to use Java 6

If you want to use Spring Boot with Java 6 there are a small number of configuration changes that you will have to make. The exact changes depend on your application’s functionality.

### Embedded servlet container compatibility

If you are using one of Boot’s embedded Servlet containers you will have to use a Java 6-compatible container. Both Tomcat 7 and Jetty 8 are Java 6 compatible. See [Section 73.16, “Use Tomcat 7.x or](#_bookmark476) [8.0”](#_bookmark476) and [Section 73.18, “Use Jetty 8”](#_bookmark482) for details.

### Jackson

Jackson 2.7 and later requires Java 7. If you want to use Jackson with Java 6 you will have to downgrade to Jackson 2.6.

Spring Boot uses the Jackson BOM that was introduced as of Jackson 2.7 so you can’t just override the jackson.version property. In order to use Jackson 2.6, you will have to define the individual modules in the dependencyManagement section of your build, check [this example](https://github.com/spring-projects/spring-boot/blob/0ffc7dc13f6de82c199a6d503354a88c7aaec2d9/spring-boot-dependencies/pom.xml#L523-L597) for more details.

### JTA API compatibility

While the Java Transaction API itself doesn’t require Java 7 the official API jar contains classes that have been built to require Java 7. If you are using JTA then you will need to replace the official JTA 1.2 API jar with one that has been built to work on Java 6. To do so, exclude any transitive dependencies on javax.transaction:javax.transaction-api and replace them with a dependency on org.jboss.spec.javax.transaction:jboss-transaction-api\_1.2\_spec:1.0.0.Final

# Traditional deployment

## Create a deployable war file

The first step in producing a deployable war file is to provide a SpringBootServletInitializer subclass and override its configure method. This makes use of Spring Framework’s Servlet 3.0 support and allows you to configure your application when it’s launched by the servlet container. Typically, you update your application’s main class to extend SpringBootServletInitializer:

@SpringBootApplication

**public class** Application **extends** SpringBootServletInitializer {

@Override

**protected** SpringApplicationBuilder configure(SpringApplicationBuilder application) {

**return** application.sources(Application.**class**);

}

**public static void** main(String[] args) **throws** Exception { SpringApplication.run(Application.**class**, args);

}

}

The next step is to update your build configuration so that your project produces a war file rather than a jar file. If you’re using Maven and using spring-boot-starter-parent (which configures Maven’s war plugin for you) all you need to do is to modify pom.xml to change the packaging to war:

**<packaging>**war**</packaging>**

If you’re using Gradle, you need to modify build.gradle to apply the war plugin to the project:

apply plugin: ***'war'***

The final step in the process is to ensure that the embedded servlet container doesn’t interfere with the servlet container to which the war file will be deployed. To do so, you need to mark the embedded servlet container dependency as provided.

If you’re using Maven:

**<dependencies>**

*<!-- … -->*

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-starter-tomcat**</artifactId>**

**<scope>**provided**</scope>**

**</dependency>**

*<!-- … -->*

**</dependencies>**

And if you’re using Gradle:

dependencies {

*// …*

providedRuntime ***'org.springframework.boot:spring-boot-starter-tomcat'***

*// …*

}

**Note**

If you are using a version of Gradle that supports compile only dependencies (2.12 or later), you should continue to use providedRuntime. Among other limitations, compileOnly dependencies are not on the test classpath so any web-based integration tests will fail.

If you’re using the [Spring Boot build tools](#_bookmark407), marking the embedded servlet container dependency as provided will produce an executable war file with the provided dependencies packaged in a lib- provided directory. This means that, in addition to being deployable to a servlet container, you can also run your application using java -jar on the command line.

**Tip**

Take a look at Spring Boot’s sample applications for a [Maven-based example](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-samples/spring-boot-sample-traditional/pom.xml) of the above- described configuration.

## Create a deployable war file for older servlet containers

Older Servlet containers don’t have support for the ServletContextInitializer bootstrap process used in Servlet 3.0. You can still use Spring and Spring Boot in these containers but you are going to need to add a web.xml to your application and configure it to load an ApplicationContext via a DispatcherServlet.

## Convert an existing application to Spring Boot

For a non-web application it should be easy (throw away the code that creates your ApplicationContext and replace it with calls to SpringApplication or SpringApplicationBuilder). Spring MVC web applications are generally amenable to first creating a deployable war application, and then migrating it later to an executable war and/or jar. Useful reading is in the [Getting Started Guide on Converting a jar to a war](http://spring.io/guides/gs/convert-jar-to-war/).

Create a deployable war by extending SpringBootServletInitializer (e.g. in a class called

Application), and add the Spring Boot @SpringBootApplication annotation. Example:

@SpringBootApplication

**public class** Application **extends** SpringBootServletInitializer {

@Override

**protected** SpringApplicationBuilder configure(SpringApplicationBuilder application) {

*// Customize the application or call application.sources(...) to add sources*

*// Since our example is itself a @Configuration class (via @SpringBootApplication)*

*// we actually don't need to override this method.*

**return** application;

}

}

Remember that whatever you put in the sources is just a Spring ApplicationContext and normally anything that already works should work here. There might be some beans you can remove later and let Spring Boot provide its own defaults for them, but it should be possible to get something working first.

Static resources can be moved to /public (or /static or /resources or /META-INF/resources) in the classpath root. Same for messages.properties (Spring Boot detects this automatically in the root of the classpath).

Vanilla usage of Spring DispatcherServlet and Spring Security should require no further changes. If you have other features in your application, using other servlets or filters for instance, then you may need to add some configuration to your Application context, replacing those elements from the web.xml as follows:

* A @Bean of type Servlet or ServletRegistrationBean installs that bean in the container as if it was a <servlet/> and <servlet-mapping/> in web.xml.
* A @Bean of type Filter or FilterRegistrationBean behaves similarly (like a <filter/> and

<filter-mapping/>.

* An ApplicationContext in an XML file can be added through an @ImportResource in your Application. Or simple cases where annotation configuration is heavily used already can be recreated in a few lines as @Bean definitions.

Once the war is working we make it executable by adding a main method to our Application, e.g.

**public static void** main(String[] args) { SpringApplication.run(Application.**class**, args);

}

**Note**

If you intend to start your application as a war or as an executable application, you need to share the customizations of the builder in a method that is both available to the SpringBootServletInitializer callback and the main method, something like:

@SpringBootApplication

**public class** Application **extends** SpringBootServletInitializer {

@Override

**protected** SpringApplicationBuilder configure(SpringApplicationBuilder builder) {

**return** configureApplication(builder);

}

**public static void** main(String[] args) {

configureApplication(**new** SpringApplicationBuilder()).run(args);

}

**private static** SpringApplicationBuilder configureApplication(SpringApplicationBuilder builder) {

**return** builder.sources(Application.**class**).bannerMode(Banner.Mode.OFF);

}

}

Applications can fall into more than one category:

* Servlet 3.0+ applications with no web.xml.
* Applications with a web.xml.
* Applications with a context hierarchy.
* Applications without a context hierarchy.

All of these should be amenable to translation, but each might require slightly different tricks.

Servlet 3.0+ applications might translate pretty easily if they already use the Spring Servlet 3.0+ initializer support classes. Normally all the code from an existing WebApplicationInitializer

can be moved into a SpringBootServletInitializer. If your existing application has more than one ApplicationContext (e.g. if it uses AbstractDispatcherServletInitializer) then you might be able to squash all your context sources into a single SpringApplication. The main complication you might encounter is if that doesn’t work and you need to maintain the context hierarchy. See the [entry on building a hierarchy](#_bookmark443) for examples. An existing parent context that contains web-specific features will usually need to be broken up so that all the ServletContextAware components are in the child context.

Applications that are not already Spring applications might be convertible to a Spring Boot application, and the guidance above might help, but your mileage may vary.

## Deploying a WAR to WebLogic

To deploy a Spring Boot application to WebLogic you must ensure that your servlet initializer **directly** implements WebApplicationInitializer (even if you extend from a base class that already implements it).

A typical initializer for WebLogic would be something like this:

**import** org.springframework.boot.autoconfigure.SpringBootApplication; **import** org.springframework.boot.context.web.SpringBootServletInitializer; **import** org.springframework.web.WebApplicationInitializer;

@SpringBootApplication

**public class** MyApplication **extends** SpringBootServletInitializer **implements** WebApplicationInitializer {

}

If you use logback, you will also need to tell WebLogic to prefer the packaged version rather than the version that pre-installed with the server. You can do this by adding a WEB-INF/weblogic.xml file with the following contents:

<?xml version="1.0" encoding="UTF-8"?>

**<wls:weblogic-web-app xmlns:wls**=[**"http://xmlns.oracle.com/weblogic/weblogic-web-app"**](http://xmlns.oracle.com/weblogic/weblogic-web-app) **xmlns:xsi**=[**"http://www.w3.org/2001/XMLSchema-instance"**](http://www.w3.org/2001/XMLSchema-instance) **xsi:schemaLocation**=[**"http://java.sun.com/xml/ns/javaee**](http://java.sun.com/xml/ns/javaee)

[**http://java.sun.com/xml/ns/javaee/ejb-jar\_3\_0.xsd**](http://java.sun.com/xml/ns/javaee/ejb-jar_3_0.xsd)[**http://xmlns.oracle.com/weblogic/weblogic-web-app**](http://xmlns.oracle.com/weblogic/weblogic-web-app)[**http://xmlns.oracle.com/weblogic/weblogic-web-app/1.4/weblogic-web-app.xsd"**](http://xmlns.oracle.com/weblogic/weblogic-web-app/1.4/weblogic-web-app.xsd)**>**

**<wls:container-descriptor>**

**<wls:prefer-application-packages>**

**<wls:package-name>**org.slf4j**</wls:package-name>**

**</wls:prefer-application-packages>**

**</wls:container-descriptor>**

**</wls:weblogic-web-app>**

## Deploying a WAR in an Old (Servlet 2.5) Container

Spring Boot uses Servlet 3.0 APIs to initialize the ServletContext (register Servlets etc.) so you can’t use the same application out of the box in a Servlet 2.5 container. It **is** however possible to run a Spring Boot application on an older container with some special tools. If you include org.springframework.boot:spring-boot-legacy as a dependency ([maintained separately](https://github.com/scratches/spring-boot-legacy) to the core of Spring Boot and currently available at 1.0.2.RELEASE), all you should need to do is create a web.xml and declare a context listener to create the application context and your filters and servlets. The context listener is a special purpose one for Spring Boot, but the rest of it is normal for a Spring application in Servlet 2.5. Example:

<?xml version="1.0" encoding="UTF-8"?>

**<web-app version**=**"2.5" xmlns**=[**"http://java.sun.com/xml/ns/javaee"**](http://java.sun.com/xml/ns/javaee) **xmlns:xsi**=[**"http://www.w3.org/2001/XMLSchema-instance"**](http://www.w3.org/2001/XMLSchema-instance) **xsi:schemaLocation**=[**"http://java.sun.com/xml/ns/javaee**](http://java.sun.com/xml/ns/javaee)[**http://java.sun.com/xml/ns/javaee/web-**](http://java.sun.com/xml/ns/javaee/web-)

**app\_2\_5.xsd">**

**<context-param>**

**<param-name>**contextConfigLocation**</param-name>**

**<param-value>**demo.Application**</param-value>**

**</context-param>**

**<listener>**

**<listener-class>**org.springframework.boot.legacy.context.web.SpringBootContextLoaderListener**</ listener-class>**

**</listener>**

**<filter>**

**<filter-name>**metricsFilter**</filter-name>**

**<filter-class>**org.springframework.web.filter.DelegatingFilterProxy**</filter-class>**

**</filter>**

**<filter-mapping>**

**<filter-name>**metricsFilter**</filter-name>**

**<url-pattern>**/\***</url-pattern>**

**</filter-mapping>**

**<servlet>**

**<servlet-name>**appServlet**</servlet-name>**

**<servlet-class>**org.springframework.web.servlet.DispatcherServlet**</servlet-class>**

**<init-param>**

**<param-name>**contextAttribute**</param-name>**

**<param-value>**org.springframework.web.context.WebApplicationContext.ROOT**</param-value>**

**</init-param>**

**<load-on-startup>**1**</load-on-startup>**

**</servlet>**

**<servlet-mapping>**

**<servlet-name>**appServlet**</servlet-name>**

**<url-pattern>**/**</url-pattern>**

**</servlet-mapping>**

**</web-app>**

In this example we are using a single application context (the one created by the context listener) and attaching it to the DispatcherServlet using an init parameter. This is normal in a Spring Boot application (you normally only have one application context).

**Part X. Appendices**

**Appendix A. Common application properties**

Various properties can be specified inside your application.properties/application.yml file or as command line switches. This section provides a list of common Spring Boot properties and references to the underlying classes that consume them.

**Note**

Property contributions can come from additional jar files on your classpath so you should not consider this an exhaustive list. It is also perfectly legit to define your own properties.

**Warning**

This sample file is meant as a guide only. Do **not** copy/paste the entire content into your application; rather pick only the properties that you need.

*# =================================================================== # COMMON SPRING BOOT PROPERTIES*

*#*

*# This sample file is provided as a guideline. Do NOT copy it in its # entirety to your own application. ^^^*

*# ===================================================================*

*# ---------------------------------------- # CORE PROPERTIES*

*# ----------------------------------------*

*# BANNER*

**banner.charset**=UTF-8 *# Banner file encoding.*

**banner.location**=classpath:banner.txt *# Banner file location.* **banner.image.location**=classpath:banner.gif *# Banner image file location (jpg/png can also be used).* **banner.image.width**= *# Width of the banner image in chars (default 76)*

**banner.image.height**= *# Height of the banner image in chars (default based on image height)*

**banner.image.margin**= *# Left hand image margin in chars (default 2)*

**banner.image.invert**= *# If images should be inverted for dark terminal themes (default false)*

*# LOGGING*

**logging.config**= *# Location of the logging configuration file. For instance `classpath:logback.xml` for Logback*

**logging.exception-conversion-word**=%wEx *# Conversion word used when logging exceptions.*

**logging.file**= *# Log file name. For instance `myapp.log`*

**logging.level.\***= *# Log levels severity mapping. For instance `logging.level.org.springframework=DEBUG`*

**logging.path**= *# Location of the log file. For instance `/var/log`*

**logging.pattern.console**= *# Appender pattern for output to the console. Only supported with the default logback setup.*

**logging.pattern.file**= *# Appender pattern for output to the file. Only supported with the default logback setup.*

**logging.pattern.level**= *# Appender pattern for log level (default %5p). Only supported with the default logback setup.*

**logging.register-shutdown-hook**=false *# Register a shutdown hook for the logging system when it is initialized.*

*# AOP*

**spring.aop.auto**=true *# Add @EnableAspectJAutoProxy.*

**spring.aop.proxy-target-class**= *# Whether subclass-based (CGLIB) proxies are to be created (true) as opposed to standard Java interface-based proxies (false). Defaults to "true" when using Spring Transaction Management, otherwise "false".*

*# IDENTITY (*[ContextIdApplicationContextInitializer](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/context/ContextIdApplicationContextInitializer.java))

**spring.application.index**= *# Application index.*

**spring.application.name**= *# Application name.*

*# ADMIN (*[SpringApplicationAdminJmxAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/admin/SpringApplicationAdminJmxAutoConfiguration.java))

**spring.application.admin.enabled**=false *# Enable admin features for the application.*

**spring.application.admin.jmx-name**=org.springframework.boot:type=Admin,name=SpringApplication *# JMX name of the application admin MBean.*

*# AUTO-CONFIGURATION*

**spring.autoconfigure.exclude**= *# Auto-configuration classes to exclude.*

*# SPRING CORE*

**spring.beaninfo.ignore**=true *# Skip search of BeanInfo classes.*

*# SPRING CACHE (*[CacheProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/cache/CacheProperties.java))

**spring.cache.cache-names**= *# Comma-separated list of cache names to create if supported by the underlying cache manager.*

**spring.cache.caffeine.spec**= *# The spec to use to create caches. Check CaffeineSpec for more details on the spec format.*

**spring.cache.couchbase.expiration**=0 *# Entry expiration in milliseconds. By default the entries never expire.*

**spring.cache.ehcache.config**= *# The location of the configuration file to use to initialize EhCache.*

**spring.cache.guava.spec**= *# The spec to use to create caches. Check CacheBuilderSpec for more details on the spec format.*

**spring.cache.infinispan.config**= *# The location of the configuration file to use to initialize Infinispan.*

**spring.cache.jcache.config**= *# The location of the configuration file to use to initialize the cache manager.*

**spring.cache.jcache.provider**= *# Fully qualified name of the CachingProvider implementation to use to retrieve the JSR-107 compliant cache manager. Only needed if more than one JSR-107 implementation is available on the classpath.*

**spring.cache.type**= *# Cache type, auto-detected according to the environment by default.*

*# SPRING CONFIG - using environment property only (*[ConfigFileApplicationListener](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/context/config/ConfigFileApplicationListener.java))

**spring.config.location**= *# Config file locations.*

**spring.config.name**=application *# Config file name.*

*# HAZELCAST (*[HazelcastProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/hazelcast/HazelcastProperties.java))

**spring.hazelcast.config**= *# The location of the configuration file to use to initialize Hazelcast.*

*# PROJECT INFORMATION (*[ProjectInfoProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/info/ProjectInfoProperties.java))

**spring.info.build.location**=classpath:META-INF/build-info.properties *# Location of the generated build- info.properties file.*

**spring.info.git.location**=classpath:git.properties *# Location of the generated git.properties file.*

*# JMX*

**spring.jmx.default-domain**= *# JMX domain name.* **spring.jmx.enabled**=true *# Expose management beans to the JMX domain.* **spring.jmx.server**=mbeanServer *# MBeanServer bean name.*

*# Email (*[MailProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/mail/MailProperties.java))

**spring.mail.default-encoding**=UTF-8 *# Default MimeMessage encoding.*

**spring.mail.host**= *# SMTP server host. For instance `smtp.example.com`*

**spring.mail.jndi-name**= *# Session JNDI name. When set, takes precedence to others mail settings.*

**spring.mail.password**= *# Login password of the SMTP server.*

**spring.mail.port**= *# SMTP server port.*

**spring.mail.properties.\***= *# Additional JavaMail session properties.*

**spring.mail.protocol**=smtp *# Protocol used by the SMTP server.*

**spring.mail.test-connection**=false *# Test that the mail server is available on startup.*

**spring.mail.username**= *# Login user of the SMTP server.*

*# APPLICATION SETTINGS (*[SpringApplication](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/SpringApplication.java))

**spring.main.banner-mode**=console *# Mode used to display the banner when the application runs.*

**spring.main.sources**= *# Sources (class name, package name or XML resource location) to include in the ApplicationContext.*

**spring.main.web-environment**= *# Run the application in a web environment (auto-detected by default).*

*# FILE ENCODING (*[FileEncodingApplicationListener](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/context/FileEncodingApplicationListener.java))

**spring.mandatory-file-encoding**= *# Expected character encoding the application must use. # INTERNATIONALIZATION (*[MessageSourceAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/context/MessageSourceAutoConfiguration.java))

**spring.messages.always-use-message-format**=false *# Set whether to always apply the MessageFormat rules, parsing even messages without arguments.*

**spring.messages.basename**=messages *# Comma-separated list of basenames, each following the ResourceBundle convention.*

**spring.messages.cache-seconds**=-1 *# Loaded resource bundle files cache expiration, in seconds. When set to -1, bundles are cached forever.*

**spring.messages.encoding**=UTF-8 *# Message bundles encoding.*

**spring.messages.fallback-to-system-locale**=true *# Set whether to fall back to the system Locale if no files for a specific Locale have been found.*

*# OUTPUT*

**spring.output.ansi.enabled**=detect *# Configure the ANSI output.*

*# PID FILE (*[ApplicationPidFileWriter](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/system/ApplicationPidFileWriter.java))

**spring.pid.fail-on-write-error**= *# Fail if ApplicationPidFileWriter is used but it cannot write the PID file.*

**spring.pid.file**= *# Location of the PID file to write (if ApplicationPidFileWriter is used).*

*# PROFILES*

**spring.profiles.active**= *# Comma-separated list (or list if using YAML) of* [active profiles](#_bookmark453).

**spring.profiles.include**= *# Unconditionally activate the specified comma separated profiles (or list of profiles if using YAML).*

*# SENDGRID (*[SendGridAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/sendgrid/SendGridAutoConfiguration.java))

**spring.sendgrid.api-key**= *# SendGrid api key (alternative to username/password).* **spring.sendgrid.username**= *# SendGrid account username.* **spring.sendgrid.password**= *# SendGrid account password.* **spring.sendgrid.proxy.host**= *# SendGrid proxy host.*

**spring.sendgrid.proxy.port**= *# SendGrid proxy port.*

*# ---------------------------------------- # WEB PROPERTIES*

*# ----------------------------------------*

*# EMBEDDED SERVER CONFIGURATION (*[ServerProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/ServerProperties.java))

**server.address**= *# Network address to which the server should bind to.* **server.compression.enabled**=false *# If response compression is enabled.* **server.compression.excluded-user-agents**= *# List of user-agents to exclude from compression.* **server.compression.mime-types**=text/html,text/xml,text/plain,text/css,text/javascript,application/ javascript *# Comma-separated list of MIME types that should be compressed.*

**server.compression.min-response-size**=2048 *# Minimum response size that is required for compression to be performed.*

**server.connection-timeout**= *# Time in milliseconds that connectors will wait for another HTTP request before closing the connection. When not set, the connector's container-specific default will be used. Use a value of -1 to indicate no (i.e. infinite) timeout.*

**server.context-parameters.\***= *# Servlet context init parameters. For instance `server.context- parameters.a=alpha`*

**server.context-path**= *# Context path of the application.*

**server.display-name**=application *# Display name of the application.*

**server.max-http-header-size**=0 *# Maximum size in bytes of the HTTP message header.* **server.error.include-stacktrace**=never *# When to include a "stacktrace" attribute.* **server.error.path**=/error *# Path of the error controller.*

**server.error.whitelabel.enabled**=true *# Enable the default error page displayed in browsers in case of a server error.*

**server.jetty.acceptors**= *# Number of acceptor threads to use.*

**server.jetty.max-http-post-size**=0 *# Maximum size in bytes of the HTTP post or put content.*

**server.jetty.selectors**= *# Number of selector threads to use.*

**server.jsp-servlet.class-name**=org.apache.jasper.servlet.JspServlet *# The class name of the JSP servlet.*

**server.jsp-servlet.init-parameters.\***= *# Init parameters used to configure the JSP servlet* **server.jsp-servlet.registered**=true *# Whether or not the JSP servlet is registered* **server.port**=8080 *# Server HTTP port.*

**server.server-header**= *# Value to use for the Server response header (no header is sent if empty)*

**server.servlet-path**=/ *# Path of the main dispatcher servlet.*

**server.use-forward-headers**= *# If X-Forwarded-\* headers should be applied to the HttpRequest.* **server.session.cookie.comment**= *# Comment for the session cookie.* **server.session.cookie.domain**= *# Domain for the session cookie.*

**server.session.cookie.http-only**= *# "HttpOnly" flag for the session cookie.* **server.session.cookie.max-age**= *# Maximum age of the session cookie in seconds.* **server.session.cookie.name**= *# Session cookie name.*

**server.session.cookie.path**= *# Path of the session cookie.*

**server.session.cookie.secure**= *# "Secure" flag for the session cookie.* **server.session.persistent**=false *# Persist session data between restarts.* **server.session.store-dir**= *# Directory used to store session data.* **server.session.timeout**= *# Session timeout in seconds.*

**server.session.tracking-modes**= *# Session tracking modes (one or more of the following: "cookie", "url", "ssl").*

**server.ssl.ciphers**= *# Supported SSL ciphers.*

**server.ssl.client-auth**= *# Whether client authentication is wanted ("want") or needed ("need"). Requires a trust store.*

**server.ssl.enabled**= *# Enable SSL support.*

**server.ssl.enabled-protocols**= *# Enabled SSL protocols.*

**server.ssl.key-alias**= *# Alias that identifies the key in the key store.*

**server.ssl.key-password**= *# Password used to access the key in the key store.*

**server.ssl.key-store**= *# Path to the key store that holds the SSL certificate (typically a jks file).*

**server.ssl.key-store-password**= *# Password used to access the key store.* **server.ssl.key-store-provider**= *# Provider for the key store.* **server.ssl.key-store-type**= *# Type of the key store.* **server.ssl.protocol**=TLS *# SSL protocol to use.*

**server.ssl.trust-store**= *# Trust store that holds SSL certificates.* **server.ssl.trust-store-password**= *# Password used to access the trust store.* **server.ssl.trust-store-provider**= *# Provider for the trust store.* **server.ssl.trust-store-type**= *# Type of the trust store.*

**server.tomcat.accept-count**= *# Maximum queue length for incoming connection requests when all possible request processing threads are in use.*

**server.tomcat.accesslog.buffered**=true *# Buffer output such that it is only flushed periodically.*

**server.tomcat.accesslog.directory**=logs *# Directory in which log files are created. Can be relative to the tomcat base dir or absolute.*

**server.tomcat.accesslog.enabled**=false *# Enable access log.*

**server.tomcat.accesslog.file-date-format**=.yyyy-MM-dd *# Date format to place in log file name.* **server.tomcat.accesslog.pattern**=common *# Format pattern for access logs.* **server.tomcat.accesslog.prefix**=access\_log *# Log file name prefix.*

**server.tomcat.accesslog.rename-on-rotate**=false *# Defer inclusion of the date stamp in the file name until rotate time.*

**server.tomcat.accesslog.request-attributes-enabled**=false *# Set request attributes for IP address, Hostname, protocol and port used for the request.*

**server.tomcat.accesslog.rotate**=true *# Enable access log rotation.*

**server.tomcat.accesslog.suffix**=.log *# Log file name suffix.*

**server.tomcat.additional-tld-skip-patterns**= *# Comma-separated list of additional patterns that match jars to ignore for TLD scanning.*

**server.tomcat.background-processor-delay**=30 *# Delay in seconds between the invocation of backgroundProcess methods.*

**server.tomcat.basedir**= *# Tomcat base directory. If not specified a temporary directory will be used.*

**server.tomcat.internal-proxies**=10\\.\\d{1,3}\\.\\d{1,3}\\.\\d{1,3}|\\ 192\\.168\\.\\d{1,3}\\.\\d{1,3}|\\

169\\.254\\.\\d{1,3}\\.\\d{1,3}|\\

127\\.\\d{1,3}\\.\\d{1,3}\\.\\d{1,3}|\\

172\\.1[6-9]{1}\\.\\d{1,3}\\.\\d{1,3}|\\

172\\.2[0-9]{1}\\.\\d{1,3}\\.\\d{1,3}|\\

172\\.3[0-1]{1}\\.\\d{1,3}\\.\\d{1,3} *# regular expression matching trusted IP addresses.*

**server.tomcat.max-connections**= *# Maximum number of connections that the server will accept and process at any given time.*

**server.tomcat.max-http-post-size**=0 *# Maximum size in bytes of the HTTP post content.*

**server.tomcat.max-threads**=0 *# Maximum amount of worker threads.*

**server.tomcat.min-spare-threads**=0 *# Minimum amount of worker threads.*

**server.tomcat.port-header**=X-Forwarded-Port *# Name of the HTTP header used to override the original port value.*

**server.tomcat.protocol-header**= *# Header that holds the incoming protocol, usually named "X-Forwarded- Proto".*

**server.tomcat.protocol-header-https-value**=https *# Value of the protocol header that indicates that the incoming request uses SSL.*

**server.tomcat.redirect-context-root**= *# Whether requests to the context root should be redirected by appending a / to the path.*

**server.tomcat.remote-ip-header**= *# Name of the http header from which the remote ip is extracted. For instance `X-FORWARDED-FOR`*

**server.tomcat.uri-encoding**=UTF-8 *# Character encoding to use to decode the URI.* **server.undertow.accesslog.dir**= *# Undertow access log directory.* **server.undertow.accesslog.enabled**=false *# Enable access log.* **server.undertow.accesslog.pattern**=common *# Format pattern for access logs.* **server.undertow.accesslog.prefix**=access\_log. *# Log file name prefix.* **server.undertow.accesslog.rotate**=true *# Enable access log rotation.* **server.undertow.accesslog.suffix**=log *# Log file name suffix.*

**server.undertow.buffer-size**= *# Size of each buffer in bytes.* **server.undertow.direct-buffers**= *# Allocate buffers outside the Java heap.* **server.undertow.io-threads**= *# Number of I/O threads to create for the worker.*

**server.undertow.max-http-post-size**=0 *# Maximum size in bytes of the HTTP post content.*

**server.undertow.worker-threads**= *# Number of worker threads.*

*# FREEMARKER (*[FreeMarkerAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/freemarker/FreeMarkerAutoConfiguration.java))

**spring.freemarker.allow-request-override**=false *# Set whether HttpServletRequest attributes are allowed to override (hide) controller generated model attributes of the same name.*

**spring.freemarker.allow-session-override**=false *# Set whether HttpSession attributes are allowed to override (hide) controller generated model attributes of the same name.*

**spring.freemarker.cache**=false *# Enable template caching.*

**spring.freemarker.charset**=UTF-8 *# Template encoding.*

**spring.freemarker.check-template-location**=true *# Check that the templates location exists.* **spring.freemarker.content-type**=text/html *# Content-Type value.* **spring.freemarker.enabled**=true *# Enable MVC view resolution for this technology.*

**spring.freemarker.expose-request-attributes**=false *# Set whether all request attributes should be added to the model prior to merging with the template.*

**spring.freemarker.expose-session-attributes**=false *# Set whether all HttpSession attributes should be added to the model prior to merging with the template.*

**spring.freemarker.expose-spring-macro-helpers**=true *# Set whether to expose a RequestContext for use by Spring's macro library, under the name "springMacroRequestContext".*

**spring.freemarker.prefer-file-system-access**=true *# Prefer file system access for template loading. File system access enables hot detection of template changes.*

**spring.freemarker.prefix**= *# Prefix that gets prepended to view names when building a URL.* **spring.freemarker.request-context-attribute**= *# Name of the RequestContext attribute for all views.* **spring.freemarker.settings.\***= *# Well-known FreeMarker keys which will be passed to FreeMarker's*

*Configuration.*

**spring.freemarker.suffix**=.ftl *# Suffix that gets appended to view names when building a URL.* **spring.freemarker.template-loader-path**=classpath:/templates/ *# Comma-separated list of template paths.* **spring.freemarker.view-names**= *# White list of view names that can be resolved.*

*# GROOVY TEMPLATES (*[GroovyTemplateAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/groovy/template/GroovyTemplateAutoConfiguration.java))

**spring.groovy.template.allow-request-override**=false *# Set whether HttpServletRequest attributes are allowed to override (hide) controller generated model attributes of the same name.*

**spring.groovy.template.allow-session-override**=false *# Set whether HttpSession attributes are allowed to override (hide) controller generated model attributes of the same name.*

**spring.groovy.template.cache**= *# Enable template caching.*

**spring.groovy.template.charset**=UTF-8 *# Template encoding.*

**spring.groovy.template.check-template-location**=true *# Check that the templates location exists.* **spring.groovy.template.configuration.\***= *# See GroovyMarkupConfigurer* **spring.groovy.template.content-type**=test/html *# Content-Type value.* **spring.groovy.template.enabled**=true *# Enable MVC view resolution for this technology.*

**spring.groovy.template.expose-request-attributes**=false *# Set whether all request attributes should be added to the model prior to merging with the template.*

**spring.groovy.template.expose-session-attributes**=false *# Set whether all HttpSession attributes should be added to the model prior to merging with the template.*

**spring.groovy.template.expose-spring-macro-helpers**=true *# Set whether to expose a RequestContext for use by Spring's macro library, under the name "springMacroRequestContext".*

**spring.groovy.template.prefix**= *# Prefix that gets prepended to view names when building a URL.* **spring.groovy.template.request-context-attribute**= *# Name of the RequestContext attribute for all views.* **spring.groovy.template.resource-loader-path**=classpath:/templates/ *# Template path.* **spring.groovy.template.suffix**=.tpl *# Suffix that gets appended to view names when building a URL.* **spring.groovy.template.view-names**= *# White list of view names that can be resolved.*

*# SPRING HATEOAS (*[HateoasProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/hateoas/HateoasProperties.java))

**spring.hateoas.use-hal-as-default-json-media-type**=true *# Specify if application/hal+json responses should be sent to requests that accept application/json.*

*# HTTP message conversion*

**spring.http.converters.preferred-json-mapper**=jackson *# Preferred JSON mapper to use for HTTP message conversion. Set to "gson" to force the use of Gson when both it and Jackson are on the classpath.*

*# HTTP encoding (*[HttpEncodingProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/HttpEncodingProperties.java))

**spring.http.encoding.charset**=UTF-8 *# Charset of HTTP requests and responses. Added to the "Content-Type" header if not set explicitly.*

**spring.http.encoding.enabled**=true *# Enable http encoding support.*

**spring.http.encoding.force**= *# Force the encoding to the configured charset on HTTP requests and responses.*

**spring.http.encoding.force-request**= *# Force the encoding to the configured charset on HTTP requests. Defaults to true when "force" has not been specified.*

**spring.http.encoding.force-response**= *# Force the encoding to the configured charset on HTTP responses.*

**spring.http.encoding.mapping**= *# Locale to Encoding mapping.*

*# MULTIPART (*[MultipartProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/MultipartProperties.java))

**spring.http.multipart.enabled**=true *# Enable support of multi-part uploads.*

**spring.http.multipart.file-size-threshold**=0 *# Threshold after which files will be written to disk. Values can use the suffixed "MB" or "KB" to indicate a Megabyte or Kilobyte size.*

**spring.http.multipart.location**= *# Intermediate location of uploaded files.*

**spring.http.multipart.max-file-size**=1MB *# Max file size. Values can use the suffixed "MB" or "KB" to indicate a Megabyte or Kilobyte size.*

**spring.http.multipart.max-request-size**=10MB *# Max request size. Values can use the suffixed "MB" or "KB" to indicate a Megabyte or Kilobyte size.*

**spring.http.multipart.resolve-lazily**=false *# Whether to resolve the multipart request lazily at the time of file or parameter access.*

*# JACKSON (*[JacksonProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jackson/JacksonProperties.java))

**spring.jackson.date-format**= *# Date format string or a fully-qualified date format class name. For instance `yyyy-MM-dd HH:mm:ss`.*

**spring.jackson.default-property-inclusion**= *# Controls the inclusion of properties during serialization.*

**spring.jackson.deserialization.\***= *# Jackson on/off features that affect the way Java objects are deserialized.*

**spring.jackson.generator.\***= *# Jackson on/off features for generators.*

**spring.jackson.joda-date-time-format**= *# Joda date time format string. If not configured, "date-format" will be used as a fallback if it is configured with a format string.*

**spring.jackson.locale**= *# Locale used for formatting.* **spring.jackson.mapper.\***= *# Jackson general purpose on/off features.* **spring.jackson.parser.\***= *# Jackson on/off features for parsers.*

**spring.jackson.property-naming-strategy**= *# One of the constants on Jackson's PropertyNamingStrategy. Can also be a fully-qualified class name of a PropertyNamingStrategy subclass.*

**spring.jackson.serialization.\***= *# Jackson on/off features that affect the way Java objects are serialized.*

**spring.jackson.time-zone**= *# Time zone used when formatting dates. For instance `America/Los\_Angeles`*

*# JERSEY (*[JerseyProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jersey/JerseyProperties.java))

**spring.jersey.application-path**= *# Path that serves as the base URI for the application. Overrides the value of "@ApplicationPath" if specified.*

**spring.jersey.filter.order**=0 *# Jersey filter chain order.*

**spring.jersey.init.\***= *# Init parameters to pass to Jersey via the servlet or filter.* **spring.jersey.servlet.load-on-startup**=-1 *# Load on startup priority of the Jersey servlet.* **spring.jersey.type**=servlet *# Jersey integration type.*

*# SPRING LDAP (*[LdapProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/ldap/LdapProperties.java))

**spring.ldap.urls**= *# LDAP URLs of the server.*

**spring.ldap.base**= *# Base suffix from which all operations should originate.*

**spring.ldap.username**= *# Login user of the server.* **spring.ldap.password**= *# Login password of the server.* **spring.ldap.base-environment.\***= *# LDAP specification settings.*

*# EMBEDDED LDAP (*[EmbeddedLdapProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/ldap/embedded/EmbeddedLdapProperties.java))

**spring.ldap.embedded.base-dn**= *# The base DN* **spring.ldap.embedded.credential.username**= *# Embedded LDAP username.* **spring.ldap.embedded.credential.password**= *# Embedded LDAP password.*

**spring.ldap.embedded.ldif**=classpath:schema.ldif *# Schema (LDIF) script resource reference.* **spring.ldap.embedded.port**= *# Embedded LDAP port.* **spring.ldap.embedded.validation.enabled**=true *# Enable LDAP schema validation.* **spring.ldap.embedded.validation.schema**= *# Path to the custom schema.*

*# SPRING MOBILE DEVICE VIEWS (*[DeviceDelegatingViewResolverAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/mobile/DeviceDelegatingViewResolverAutoConfiguration.java))

**spring.mobile.devicedelegatingviewresolver.enable-fallback**=false *# Enable support for fallback resolution.*

**spring.mobile.devicedelegatingviewresolver.enabled**=false *# Enable device view resolver.*

**spring.mobile.devicedelegatingviewresolver.mobile-prefix**=mobile/ *# Prefix that gets prepended to view names for mobile devices.*

**spring.mobile.devicedelegatingviewresolver.mobile-suffix**= *# Suffix that gets appended to view names for mobile devices.*

**spring.mobile.devicedelegatingviewresolver.normal-prefix**= *# Prefix that gets prepended to view names for normal devices.*

**spring.mobile.devicedelegatingviewresolver.normal-suffix**= *# Suffix that gets appended to view names for normal devices.*

**spring.mobile.devicedelegatingviewresolver.tablet-prefix**=tablet/ *# Prefix that gets prepended to view names for tablet devices.*

**spring.mobile.devicedelegatingviewresolver.tablet-suffix**= *# Suffix that gets appended to view names for tablet devices.*

*# SPRING MOBILE SITE PREFERENCE (*[SitePreferenceAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/mobile/SitePreferenceAutoConfiguration.java))

**spring.mobile.sitepreference.enabled**=true *# Enable SitePreferenceHandler.*

*# MUSTACHE TEMPLATES (*[MustacheAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/mustache/MustacheAutoConfiguration.java))

**spring.mustache.allow-request-override**= *# Set whether HttpServletRequest attributes are allowed to override (hide) controller generated model attributes of the same name.*

**spring.mustache.allow-session-override**= *# Set whether HttpSession attributes are allowed to override (hide) controller generated model attributes of the same name.*

**spring.mustache.cache**= *# Enable template caching.*

**spring.mustache.charset**= *# Template encoding.*

**spring.mustache.check-template-location**= *# Check that the templates location exists.*

**spring.mustache.content-type**= *# Content-Type value.*

**spring.mustache.enabled**= *# Enable MVC view resolution for this technology.*

**spring.mustache.expose-request-attributes**= *# Set whether all request attributes should be added to the model prior to merging with the template.*

**spring.mustache.expose-session-attributes**= *# Set whether all HttpSession attributes should be added to the model prior to merging with the template.*

**spring.mustache.expose-spring-macro-helpers**= *# Set whether to expose a RequestContext for use by Spring's macro library, under the name "springMacroRequestContext".*

**spring.mustache.prefix**=classpath:/templates/ *# Prefix to apply to template names.* **spring.mustache.request-context-attribute**= *# Name of the RequestContext attribute for all views.* **spring.mustache.suffix**=.html *# Suffix to apply to template names.*

**spring.mustache.view-names**= *# White list of view names that can be resolved.*

*# SPRING MVC (*[WebMvcProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/WebMvcProperties.java))

**spring.mvc.async.request-timeout**= *# Amount of time (in milliseconds) before asynchronous request handling times out.*

**spring.mvc.date-format**= *# Date format to use. For instance `dd/MM/yyyy`.*

**spring.mvc.dispatch-trace-request**=false *# Dispatch TRACE requests to the FrameworkServlet doService method.*

**spring.mvc.dispatch-options-request**=true *# Dispatch OPTIONS requests to the FrameworkServlet doService method.*

**spring.mvc.favicon.enabled**=true *# Enable resolution of favicon.ico.* **spring.mvc.formcontent.putfilter.enabled**=true *# Enable Spring's HttpPutFormContentFilter.* **spring.mvc.ignore-default-model-on-redirect**=true *# If the content of the "default" model should be*

*ignored during redirect scenarios.*

**spring.mvc.locale**= *# Locale to use. By default, this locale is overridden by the "Accept-Language" header.*

**spring.mvc.locale-resolver**=accept-header *# Define how the locale should be resolved.*

**spring.mvc.log-resolved-exception**=false *# Enable warn logging of exceptions resolved by a "HandlerExceptionResolver".*

**spring.mvc.media-types.\***= *# Maps file extensions to media types for content negotiation.*

**spring.mvc.message-codes-resolver-format**= *# Formatting strategy for message codes. For instance*

*`PREFIX\_ERROR\_CODE`.*

**spring.mvc.servlet.load-on-startup**=-1 *# Load on startup priority of the Spring Web Services servlet.*

**spring.mvc.static-path-pattern**=/\*\* *# Path pattern used for static resources.*

**spring.mvc.throw-exception-if-no-handler-found**=false *# If a "NoHandlerFoundException" should be thrown if no Handler was found to process a request.*

**spring.mvc.view.prefix**= *# Spring MVC view prefix.*

**spring.mvc.view.suffix**= *# Spring MVC view suffix.*

*# SPRING RESOURCES HANDLING (*[ResourceProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/ResourceProperties.java))

**spring.resources.add-mappings**=true *# Enable default resource handling.*

**spring.resources.cache-period**= *# Cache period for the resources served by the resource handler, in seconds.*

**spring.resources.chain.cache**=true *# Enable caching in the Resource chain.*

**spring.resources.chain.enabled**= *# Enable the Spring Resource Handling chain. Disabled by default unless at least one strategy has been enabled.*

**spring.resources.chain.gzipped**=false *# Enable resolution of already gzipped resources.* **spring.resources.chain.html-application-cache**=false *# Enable HTML5 application cache manifest rewriting.* **spring.resources.chain.strategy.content.enabled**=false *# Enable the content Version Strategy.* **spring.resources.chain.strategy.content.paths**=/\*\* *# Comma-separated list of patterns to apply to the*

*Version Strategy.*

**spring.resources.chain.strategy.fixed.enabled**=false *# Enable the fixed Version Strategy.*

**spring.resources.chain.strategy.fixed.paths**=/\*\* *# Comma-separated list of patterns to apply to the Version Strategy.*

**spring.resources.chain.strategy.fixed.version**= *# Version string to use for the Version Strategy.*

**spring.resources.static-locations**=classpath:/META-INF/resources/,classpath:/resources/,classpath:/ static/,classpath:/public/ *# Locations of static resources.*

*# SPRING SESSION (*[SessionProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/session/SessionProperties.java))

**spring.session.hazelcast.flush-mode**=on-save *# Sessions flush mode.*

**spring.session.hazelcast.map-name**=spring:session:sessions *# Name of the map used to store sessions.*

**spring.session.jdbc.initializer.enabled**= *# Create the required session tables on startup if necessary. Enabled automatically if the default table name is set or a custom schema is configured.*

[**spring.session.jdbc.schema**=classpath:org/springframework/session/jdbc/schema-@@platform@@.sql](mailto:org/springframework/session/jdbc/schema-@@platform@@.sql) *# Path to the SQL file to use to initialize the database schema.*

**spring.session.jdbc.table-name**=SPRING\_SESSION *# Name of database table used to store sessions.* **spring.session.mongo.collection-name**=sessions *# Collection name used to store sessions.* **spring.session.redis.flush-mode**=on-save *# Sessions flush mode.*

**spring.session.redis.namespace**= *# Namespace for keys used to store sessions.*

**spring.session.store-type**= *# Session store type.*

*# SPRING SOCIAL (*[SocialWebAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/social/SocialWebAutoConfiguration.java))

**spring.social.auto-connection-views**=false *# Enable the connection status view for supported providers.*

*# SPRING SOCIAL FACEBOOK (*[FacebookAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/social/FacebookAutoConfiguration.java)) **spring.social.facebook.app-id**= *# your application's Facebook App ID* **spring.social.facebook.app-secret**= *# your application's Facebook App Secret*

*# SPRING SOCIAL LINKEDIN (*[LinkedInAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/social/LinkedInAutoConfiguration.java)) **spring.social.linkedin.app-id**= *# your application's LinkedIn App ID* **spring.social.linkedin.app-secret**= *# your application's LinkedIn App Secret*

*# SPRING SOCIAL TWITTER (*[TwitterAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/social/TwitterAutoConfiguration.java)) **spring.social.twitter.app-id**= *# your application's Twitter App ID* **spring.social.twitter.app-secret**= *# your application's Twitter App Secret*

*# THYMELEAF (*[ThymeleafAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/thymeleaf/ThymeleafAutoConfiguration.java))

**spring.thymeleaf.cache**=true *# Enable template caching.*

**spring.thymeleaf.check-template**=true *# Check that the template exists before rendering it.* **spring.thymeleaf.check-template-location**=true *# Check that the templates location exists.* **spring.thymeleaf.content-type**=text/html *# Content-Type value.* **spring.thymeleaf.enabled**=true *# Enable MVC Thymeleaf view resolution.* **spring.thymeleaf.encoding**=UTF-8 *# Template encoding.*

**spring.thymeleaf.excluded-view-names**= *# Comma-separated list of view names that should be excluded from resolution.*

**spring.thymeleaf.mode**=HTML5 *# Template mode to be applied to templates. See also StandardTemplateModeHandlers.*

**spring.thymeleaf.prefix**=classpath:/templates/ *# Prefix that gets prepended to view names when building a URL.*

**spring.thymeleaf.suffix**=.html *# Suffix that gets appended to view names when building a URL.* **spring.thymeleaf.template-resolver-order**= *# Order of the template resolver in the chain.* **spring.thymeleaf.view-names**= *# Comma-separated list of view names that can be resolved.*

*# SPRING WEB SERVICES (*[WebServicesProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/webservices/WebServicesProperties.java))

**spring.webservices.path**=/services *# Path that serves as the base URI for the services.* **spring.webservices.servlet.init**= *# Servlet init parameters to pass to Spring Web Services.* **spring.webservices.servlet.load-on-startup**=-1 *# Load on startup priority of the Spring Web Services*

*servlet.*

*# ---------------------------------------- # SECURITY PROPERTIES*

*# ----------------------------------------*

*# SECURITY (*[SecurityProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/security/SecurityProperties.java))

**security.basic.authorize-mode**=role *# Security authorize mode to apply.* **security.basic.enabled**=true *# Enable basic authentication.* **security.basic.path**=/\*\* *# Comma-separated list of paths to secure.* **security.basic.realm**=Spring *# HTTP basic realm name.*

**security.enable-csrf**=false *# Enable Cross Site Request Forgery support.*

**security.filter-order**=0 *# Security filter chain order.*

**security.filter-dispatcher-types**=ASYNC, FORWARD, INCLUDE, REQUEST *# Security filter chain dispatcher types.*

**security.headers.cache**=true *# Enable cache control HTTP headers.* **security.headers.content-security-policy**= *# Value for content security policy header.* **security.headers.content-security-policy-mode**=default *# Content security policy mode.*

**security.headers.content-type**=true *# Enable "X-Content-Type-Options" header.*

**security.headers.frame**=true *# Enable "X-Frame-Options" header.*

**security.headers.hsts**=all *# HTTP Strict Transport Security (HSTS) mode (none, domain, all).*

**security.headers.xss**=true *# Enable cross site scripting (XSS) protection.*

**security.ignored**= *# Comma-separated list of paths to exclude from the default secured paths.* **security.require-ssl**=false *# Enable secure channel for all requests.* **security.sessions**=stateless *# Session creation policy (always, never, if\_required, stateless).* **security.user.name**=user *# Default user name.*

**security.user.password**= *# Password for the default user name. A random password is logged on startup by default.*

**security.user.role**=USER *# Granted roles for the default user name.*

*# SECURITY OAUTH2 CLIENT (*[OAuth2ClientProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/security/oauth2/OAuth2ClientProperties.java))

**security.oauth2.client.client-id**= *# OAuth2 client id.*

**security.oauth2.client.client-secret**= *# OAuth2 client secret. A random secret is generated by default*

*# SECURITY OAUTH2 RESOURCES (*[ResourceServerProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/security/oauth2/resource/ResourceServerProperties.java))

**security.oauth2.resource.filter-order**= *# The order of the filter chain used to authenticate tokens.*

**security.oauth2.resource.id**= *# Identifier of the resource.*

**security.oauth2.resource.jwt.key-uri**= *# The URI of the JWT token. Can be set if the value is not available and the key is public.*

**security.oauth2.resource.jwt.key-value**= *# The verification key of the JWT token. Can either be a symmetric secret or PEM-encoded RSA public key.*

**security.oauth2.resource.jwk.key-set-uri**= *# The URI for getting the set of keys that can be used to validate the token.*

**security.oauth2.resource.prefer-token-info**=true *# Use the token info, can be set to false to use the user info.*

**security.oauth2.resource.service-id**=resource *#*

**security.oauth2.resource.token-info-uri**= *# URI of the token decoding endpoint.* **security.oauth2.resource.token-type**= *# The token type to send when using the userInfoUri.* **security.oauth2.resource.user-info-uri**= *# URI of the user endpoint.*

*# SECURITY OAUTH2 SSO (*[OAuth2SsoProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/security/oauth2/client/OAuth2SsoProperties.java))

**security.oauth2.sso.filter-order**= *# Filter order to apply if not providing an explicit WebSecurityConfigurerAdapter*

**security.oauth2.sso.login-path**=/login *# Path to the login page, i.e. the one that triggers the redirect to the OAuth2 Authorization Server*

*# ---------------------------------------- # DATA PROPERTIES*

*# ----------------------------------------*

*# FLYWAY (*[FlywayProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/flyway/FlywayProperties.java))

**flyway.baseline-description**= *#*

**flyway.baseline-version**=1 *# version to start migration*

**flyway.baseline-on-migrate**= *#*

**flyway.check-location**=false *# Check that migration scripts location exists.*

**flyway.clean-on-validation-error**= *#* **flyway.enabled**=true *# Enable flyway.* **flyway.encoding**= *#*

**flyway.ignore-failed-future-migration**= *#*

**flyway.init-sqls**= *# SQL statements to execute to initialize a connection immediately after obtaining it.*

**flyway.locations**=classpath:db/migration *# locations of migrations scripts*

**flyway.out-of-order**= *#*

**flyway.password**= *# JDBC password if you want Flyway to create its own DataSource*

**flyway.placeholder-prefix**= *#* **flyway.placeholder-replacement**= *#* **flyway.placeholder-suffix**= *#* **flyway.placeholders.\***= *#* **flyway.schemas**= *# schemas to update* **flyway.sql-migration-prefix**=V *#* **flyway.sql-migration-separator**= *#* **flyway.sql-migration-suffix**=.sql *#* **flyway.table**= *#*

**flyway.url**= *# JDBC url of the database to migrate. If not set, the primary configured data source is used.*

**flyway.user**= *# Login user of the database to migrate.*

**flyway.validate-on-migrate**= *#*

*# LIQUIBASE (*[LiquibaseProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/liquibase/LiquibaseProperties.java))

**liquibase.change-log**=classpath:/db/changelog/db.changelog-master.yaml *# Change log configuration path.*

**liquibase.check-change-log-location**=true *# Check the change log location exists.* **liquibase.contexts**= *# Comma-separated list of runtime contexts to use.* **liquibase.default-schema**= *# Default database schema.*

**liquibase.drop-first**=false *# Drop the database schema first.* **liquibase.enabled**=true *# Enable liquibase support.* **liquibase.labels**= *# Comma-separated list of runtime labels to use.* **liquibase.parameters.\***= *# Change log parameters.* **liquibase.password**= *# Login password of the database to migrate.*

**liquibase.rollback-file**= *# File to which rollback SQL will be written when an update is performed.*

**liquibase.url**= *# JDBC url of the database to migrate. If not set, the primary configured data source is used.*

**liquibase.user**= *# Login user of the database to migrate.*

*# COUCHBASE (*[CouchbaseProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/couchbase/CouchbaseProperties.java))

**spring.couchbase.bootstrap-hosts**= *# Couchbase nodes (host or IP address) to bootstrap from.* **spring.couchbase.bucket.name**=default *# Name of the bucket to connect to.* **spring.couchbase.bucket.password**= *# Password of the bucket.*

**spring.couchbase.env.endpoints.key-value**=1 *# Number of sockets per node against the Key/value service.* **spring.couchbase.env.endpoints.query**=1 *# Number of sockets per node against the Query (N1QL) service.* **spring.couchbase.env.endpoints.view**=1 *# Number of sockets per node against the view service.* **spring.couchbase.env.ssl.enabled**= *# Enable SSL support. Enabled automatically if a "keyStore" is*

*provided unless specified otherwise.*

**spring.couchbase.env.ssl.key-store**= *# Path to the JVM key store that holds the certificates.* **spring.couchbase.env.ssl.key-store-password**= *# Password used to access the key store.* **spring.couchbase.env.timeouts.connect**=5000 *# Bucket connections timeout in milliseconds.* **spring.couchbase.env.timeouts.key-value**=2500 *# Blocking operations performed on a specific key timeout*

*in milliseconds.*

**spring.couchbase.env.timeouts.query**=7500 *# N1QL query operations timeout in milliseconds.* **spring.couchbase.env.timeouts.socket-connect**=1000 *# Socket connect connections timeout in milliseconds.* **spring.couchbase.env.timeouts.view**=7500 *# Regular and geospatial view operations timeout in*

*milliseconds.*

*# DAO (*[PersistenceExceptionTranslationAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/dao/PersistenceExceptionTranslationAutoConfiguration.java))

**spring.dao.exceptiontranslation.enabled**=true *# Enable the PersistenceExceptionTranslationPostProcessor.*

*# CASSANDRA (*[CassandraProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/cassandra/CassandraProperties.java))

**spring.data.cassandra.cluster-name**= *# Name of the Cassandra cluster.* **spring.data.cassandra.compression**=none *# Compression supported by the Cassandra binary protocol.* **spring.data.cassandra.connect-timeout-millis**= *# Socket option: connection time out.* **spring.data.cassandra.consistency-level**= *# Queries consistency level.* **spring.data.cassandra.contact-points**=localhost *# Comma-separated list of cluster node addresses.* **spring.data.cassandra.fetch-size**= *# Queries default fetch size.*

**spring.data.cassandra.keyspace-name**= *# Keyspace name to use.* **spring.data.cassandra.load-balancing-policy**= *# Class name of the load balancing policy.* **spring.data.cassandra.port**= *# Port of the Cassandra server.* **spring.data.cassandra.password**= *# Login password of the server.* **spring.data.cassandra.read-timeout-millis**= *# Socket option: read time out.* **spring.data.cassandra.reconnection-policy**= *# Reconnection policy class.* **spring.data.cassandra.repositories.enabled**= *# Enable Cassandra repositories.* **spring.data.cassandra.retry-policy**= *# Class name of the retry policy.* **spring.data.cassandra.serial-consistency-level**= *# Queries serial consistency level.* **spring.data.cassandra.schema-action**=none *# Schema action to take at startup.* **spring.data.cassandra.ssl**=false *# Enable SSL support.*

**spring.data.cassandra.username**= *# Login user of the server.*

*# DATA COUCHBASE (*[CouchbaseDataProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/data/couchbase/CouchbaseDataProperties.java))

**spring.data.couchbase.auto-index**=false *# Automatically create views and indexes.*

**spring.data.couchbase.consistency**=read-your-own-writes *# Consistency to apply by default on generated queries.*

**spring.data.couchbase.repositories.enabled**=true *# Enable Couchbase repositories.*

*# ELASTICSEARCH (*[ElasticsearchProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/data/elasticsearch/ElasticsearchProperties.java))

**spring.data.elasticsearch.cluster-name**=elasticsearch *# Elasticsearch cluster name.*

**spring.data.elasticsearch.cluster-nodes**= *# Comma-separated list of cluster node addresses. If not specified, starts a client node.*

**spring.data.elasticsearch.properties.\***= *# Additional properties used to configure the client.*

**spring.data.elasticsearch.repositories.enabled**=true *# Enable Elasticsearch repositories.*

*# DATA LDAP*

**spring.data.ldap.repositories.enabled**=true *# Enable LDAP repositories.*

*# MONGODB (*[MongoProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/mongo/MongoProperties.java))

**spring.data.mongodb.authentication-database**= *# Authentication database name.*

**spring.data.mongodb.database**=test *# Database name.*

**spring.data.mongodb.field-naming-strategy**= *# Fully qualified name of the FieldNamingStrategy to use.*

**spring.data.mongodb.grid-fs-database**= *# GridFS database name.* **spring.data.mongodb.host**=localhost *# Mongo server host. Cannot be set with uri.* **spring.data.mongodb.password**= *# Login password of the mongo server. Cannot be set with uri.* **spring.data.mongodb.port**=27017 *# Mongo server port. Cannot be set with uri.* **spring.data.mongodb.repositories.enabled**=true *# Enable Mongo repositories.*

**spring.data.mongodb.uri**=mongodb://localhost/test *# Mongo database URI. Cannot be set with host, port and credentials.*

**spring.data.mongodb.username**= *# Login user of the mongo server. Cannot be set with uri.*

*# DATA REDIS*

**spring.data.redis.repositories.enabled**=true *# Enable Redis repositories.*

*# NEO4J (*[Neo4jProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/data/neo4j/Neo4jProperties.java))

**spring.data.neo4j.compiler**= *# Compiler to use.*

**spring.data.neo4j.embedded.enabled**=true *# Enable embedded mode if the embedded driver is available.*

**spring.data.neo4j.open-in-view**=false *# Register OpenSessionInViewInterceptor. Binds a Neo4j Session to the thread for the entire processing of the request.*

**spring.data.neo4j.password**= *# Login password of the server.* **spring.data.neo4j.repositories.enabled**=true *# Enable Neo4j repositories.* **spring.data.neo4j.uri**= *# URI used by the driver. Auto-detected by default.* **spring.data.neo4j.username**= *# Login user of the server.*

*# DATA REST (*[RepositoryRestProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/data/rest/RepositoryRestProperties.java))

**spring.data.rest.base-path**= *# Base path to be used by Spring Data REST to expose repository resources.*

**spring.data.rest.default-page-size**= *# Default size of pages.*

**spring.data.rest.detection-strategy**=default *# Strategy to use to determine which repositories get exposed.*

**spring.data.rest.enable-enum-translation**= *# Enable enum value translation via the Spring Data REST default resource bundle.*

**spring.data.rest.limit-param-name**= *# Name of the URL query string parameter that indicates how many results to return at once.*

**spring.data.rest.max-page-size**= *# Maximum size of pages.*

**spring.data.rest.page-param-name**= *# Name of the URL query string parameter that indicates what page to return.*

**spring.data.rest.return-body-on-create**= *# Return a response body after creating an entity.* **spring.data.rest.return-body-on-update**= *# Return a response body after updating an entity.* **spring.data.rest.sort-param-name**= *# Name of the URL query string parameter that indicates what direction*

*to sort results.*

*# SOLR (*[SolrProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/solr/SolrProperties.java))

**spring.data.solr.host**=http://127.0.0.1:8983/solr *# Solr host. Ignored if "zk-host" is set.* **spring.data.solr.repositories.enabled**=true *# Enable Solr repositories.* **spring.data.solr.zk-host**= *# ZooKeeper host address in the form HOST:PORT.*

*# DATASOURCE (*[DataSourceAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jdbc/DataSourceAutoConfiguration.java) & [DataSourceProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jdbc/DataSourceProperties.java))

**spring.datasource.continue-on-error**=false *# Do not stop if an error occurs while initializing the database.*

**spring.datasource.data**= *# Data (DML) script resource references.*

**spring.datasource.data-username**= *# User of the database to execute DML scripts (if different).* **spring.datasource.data-password**= *# Password of the database to execute DML scripts (if different).* **spring.datasource.dbcp2.\***= *# Commons DBCP2 specific settings*

**spring.datasource.driver-class-name**= *# Fully qualified name of the JDBC driver. Auto-detected based on the URL by default.*

**spring.datasource.generate-unique-name**=false *# Generate a random datasource name.* **spring.datasource.hikari.\***= *# Hikari specific settings* **spring.datasource.initialize**=true *# Populate the database using 'data.sql'.*

**spring.datasource.jmx-enabled**=false *# Enable JMX support (if provided by the underlying pool).*

**spring.datasource.jndi-name**= *# JNDI location of the datasource. Class, url, username & password are ignored when set.*

**spring.datasource.name**=testdb *# Name of the datasource.*

**spring.datasource.password**= *# Login password of the database.*

**spring.datasource.platform**=all *# Platform to use in the DDL or DML scripts (e.g. schema-${platform}.sql or data-${platform}.sql).*

**spring.datasource.schema**= *# Schema (DDL) script resource references.*

**spring.datasource.schema-username**= *# User of the database to execute DDL scripts (if different).*

**spring.datasource.schema-password**= *# Password of the database to execute DDL scripts (if different).*

**spring.datasource.separator**=; *# Statement separator in SQL initialization scripts.* **spring.datasource.sql-script-encoding**= *# SQL scripts encoding.* **spring.datasource.tomcat.\***= *# Tomcat datasource specific settings*

**spring.datasource.type**= *# Fully qualified name of the connection pool implementation to use. By default, it is auto-detected from the classpath.*

**spring.datasource.url**= *# JDBC url of the database.*

**spring.datasource.username**= *# Login user of the database.* **spring.datasource.xa.data-source-class-name**= *# XA datasource fully qualified name.* **spring.datasource.xa.properties**= *# Properties to pass to the XA data source.*

*# JEST (Elasticsearch HTTP client) (*[JestProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/elasticsearch/jest/JestProperties.java))

**spring.elasticsearch.jest.connection-timeout**=3000 *# Connection timeout in milliseconds.*

**spring.elasticsearch.jest.multi-threaded**=true *# Enable connection requests from multiple execution threads.*

**spring.elasticsearch.jest.password**= *# Login password.* **spring.elasticsearch.jest.proxy.host**= *# Proxy host the HTTP client should use.* **spring.elasticsearch.jest.proxy.port**= *# Proxy port the HTTP client should use.* **spring.elasticsearch.jest.read-timeout**=3000 *# Read timeout in milliseconds.*

**spring.elasticsearch.jest.uris**=http://localhost:9200 *# Comma-separated list of the Elasticsearch instances to use.*

**spring.elasticsearch.jest.username**= *# Login user.*

*# H2 Web Console (*[H2ConsoleProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/h2/H2ConsoleProperties.java))

**spring.h2.console.enabled**=false *# Enable the console.*

**spring.h2.console.path**=/h2-console *# Path at which the console will be available.* **spring.h2.console.settings.trace**=false *# Enable trace output.* **spring.h2.console.settings.web-allow-others**=false *# Enable remote access.*

*# JOOQ (*[JooqAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jooq/JooqAutoConfiguration.java))

**spring.jooq.sql-dialect**= *# SQLDialect JOOQ used when communicating with the configured datasource. For instance `POSTGRES`*

*# JPA (*[JpaBaseConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/orm/jpa/JpaBaseConfiguration.java), [HibernateJpaAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/orm/jpa/HibernateJpaAutoConfiguration.java))

**spring.data.jpa.repositories.enabled**=true *# Enable JPA repositories.*

**spring.jpa.database**= *# Target database to operate on, auto-detected by default. Can be alternatively set using the "databasePlatform" property.*

**spring.jpa.database-platform**= *# Name of the target database to operate on, auto-detected by default. Can be alternatively set using the "Database" enum.*

**spring.jpa.generate-ddl**=false *# Initialize the schema on startup.*

**spring.jpa.hibernate.ddl-auto**= *# DDL mode. This is actually a shortcut for the "hibernate.hbm2ddl.auto" property. Default to "create-drop" when using an embedded database, "none" otherwise.*

**spring.jpa.hibernate.naming.implicit-strategy**= *# Hibernate 5 implicit naming strategy fully qualified name.*

**spring.jpa.hibernate.naming.physical-strategy**= *# Hibernate 5 physical naming strategy fully qualified name.*

**spring.jpa.hibernate.naming.strategy**= *# Hibernate 4 naming strategy fully qualified name. Not supported with Hibernate 5.*

**spring.jpa.hibernate.use-new-id-generator-mappings**= *# Use Hibernate's newer IdentifierGenerator for AUTO, TABLE and SEQUENCE.*

**spring.jpa.open-in-view**=true *# Register OpenEntityManagerInViewInterceptor. Binds a JPA EntityManager to the thread for the entire processing of the request.*

**spring.jpa.properties.\***= *# Additional native properties to set on the JPA provider.*

**spring.jpa.show-sql**=false *# Enable logging of SQL statements.*

*# JTA (*[JtaAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/transaction/jta/JtaAutoConfiguration.java)) **spring.jta.enabled**=true *# Enable JTA support.* **spring.jta.log-dir**= *# Transaction logs directory.*

**spring.jta.transaction-manager-id**= *# Transaction manager unique identifier.*

*# ATOMIKOS (*[AtomikosProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/jta/atomikos/AtomikosProperties.java))

**spring.jta.atomikos.connectionfactory.borrow-connection-timeout**=30 *# Timeout, in seconds, for borrowing connections from the pool.*

**spring.jta.atomikos.connectionfactory.ignore-session-transacted-flag**=true *# Whether or not to ignore the transacted flag when creating session.*

**spring.jta.atomikos.connectionfactory.local-transaction-mode**=false *# Whether or not local transactions are desired.*

**spring.jta.atomikos.connectionfactory.maintenance-interval**=60 *# The time, in seconds, between runs of the pool's maintenance thread.*

**spring.jta.atomikos.connectionfactory.max-idle-time**=60 *# The time, in seconds, after which connections are cleaned up from the pool.*

**spring.jta.atomikos.connectionfactory.max-lifetime**=0 *# The time, in seconds, that a connection can be pooled for before being destroyed. 0 denotes no limit.*

**spring.jta.atomikos.connectionfactory.max-pool-size**=1 *# The maximum size of the pool.* **spring.jta.atomikos.connectionfactory.min-pool-size**=1 *# The minimum size of the pool.* **spring.jta.atomikos.connectionfactory.reap-timeout**=0 *# The reap timeout, in seconds, for borrowed*

*connections. 0 denotes no limit.*

**spring.jta.atomikos.connectionfactory.unique-resource-name**=jmsConnectionFactory *# The unique name used to identify the resource during recovery.*

**spring.jta.atomikos.datasource.borrow-connection-timeout**=30 *# Timeout, in seconds, for borrowing connections from the pool.*

**spring.jta.atomikos.datasource.default-isolation-level**= *# Default isolation level of connections provided by the pool.*

**spring.jta.atomikos.datasource.login-timeout**= *# Timeout, in seconds, for establishing a database connection.*

**spring.jta.atomikos.datasource.maintenance-interval**=60 *# The time, in seconds, between runs of the pool's maintenance thread.*

**spring.jta.atomikos.datasource.max-idle-time**=60 *# The time, in seconds, after which connections are cleaned up from the pool.*

**spring.jta.atomikos.datasource.max-lifetime**=0 *# The time, in seconds, that a connection can be pooled for before being destroyed. 0 denotes no limit.*

**spring.jta.atomikos.datasource.max-pool-size**=1 *# The maximum size of the pool.* **spring.jta.atomikos.datasource.min-pool-size**=1 *# The minimum size of the pool.* **spring.jta.atomikos.datasource.reap-timeout**=0 *# The reap timeout, in seconds, for borrowed connections.*

*0 denotes no limit.*

**spring.jta.atomikos.datasource.test-query**= *# SQL query or statement used to validate a connection before returning it.*

**spring.jta.atomikos.datasource.unique-resource-name**=dataSource *# The unique name used to identify the resource during recovery.*

**spring.jta.atomikos.properties.checkpoint-interval**=500 *# Interval between checkpoints.* **spring.jta.atomikos.properties.default-jta-timeout**=10000 *# Default timeout for JTA transactions.* **spring.jta.atomikos.properties.enable-logging**=true *# Enable disk logging.* **spring.jta.atomikos.properties.force-shutdown-on-vm-exit**=false *# Specify if a VM shutdown should trigger*

*forced shutdown of the transaction core.*

**spring.jta.atomikos.properties.log-base-dir**= *# Directory in which the log files should be stored.* **spring.jta.atomikos.properties.log-base-name**=tmlog *# Transactions log file base name.* **spring.jta.atomikos.properties.max-actives**=50 *# Maximum number of active transactions.* **spring.jta.atomikos.properties.max-timeout**=300000 *# Maximum timeout (in milliseconds) that can be*

*allowed for transactions.*

**spring.jta.atomikos.properties.serial-jta-transactions**=true *# Specify if sub-transactions should be joined when possible.*

**spring.jta.atomikos.properties.service**= *# Transaction manager implementation that should be started.*

**spring.jta.atomikos.properties.threaded-two-phase-commit**=false *# Use different (and concurrent) threads for two-phase commit on the participating resources.*

**spring.jta.atomikos.properties.transaction-manager-unique-name**= *# Transaction manager's unique name.*

*# BITRONIX*

**spring.jta.bitronix.connectionfactory.acquire-increment**=1 *# Number of connections to create when growing the pool.*

**spring.jta.bitronix.connectionfactory.acquisition-interval**=1 *# Time, in seconds, to wait before trying to acquire a connection again after an invalid connection was acquired.*

**spring.jta.bitronix.connectionfactory.acquisition-timeout**=30 *# Timeout, in seconds, for acquiring connections from the pool.*

**spring.jta.bitronix.connectionfactory.allow-local-transactions**=true *# Whether or not the transaction manager should allow mixing XA and non-XA transactions.*

**spring.jta.bitronix.connectionfactory.apply-transaction-timeout**=false *# Whether or not the transaction timeout should be set on the XAResource when it is enlisted.*

**spring.jta.bitronix.connectionfactory.automatic-enlisting-enabled**=true *# Whether or not resources should be enlisted and delisted automatically.*

**spring.jta.bitronix.connectionfactory.cache-producers-consumers**=true *# Whether or not produces and consumers should be cached.*

**spring.jta.bitronix.connectionfactory.defer-connection-release**=true *# Whether or not the provider can run many transactions on the same connection and supports transaction interleaving.*

**spring.jta.bitronix.connectionfactory.ignore-recovery-failures**=false *# Whether or not recovery failures should be ignored.*

**spring.jta.bitronix.connectionfactory.max-idle-time**=60 *# The time, in seconds, after which connections are cleaned up from the pool.*

**spring.jta.bitronix.connectionfactory.max-pool-size**=10 *# The maximum size of the pool. 0 denotes no limit.*

**spring.jta.bitronix.connectionfactory.min-pool-size**=0 *# The minimum size of the pool.*

**spring.jta.bitronix.connectionfactory.password**= *# The password to use to connect to the JMS provider.*

**spring.jta.bitronix.connectionfactory.share-transaction-connections**=false *# Whether or not connections in the ACCESSIBLE state can be shared within the context of a transaction.*

**spring.jta.bitronix.connectionfactory.test-connections**=true *# Whether or not connections should be tested when acquired from the pool.*

**spring.jta.bitronix.connectionfactory.two-pc-ordering-position**=1 *# The position that this resource should take during two-phase commit (always first is Integer.MIN\_VALUE, always last is Integer.MAX\_VALUE).*

**spring.jta.bitronix.connectionfactory.unique-name**=jmsConnectionFactory *# The unique name used to identify the resource during recovery.*

**spring.jta.bitronix.connectionfactory.use-tm-join**=true Whether or not TMJOIN should be used when starting XAResources.

**spring.jta.bitronix.connectionfactory.user**= *# The user to use to connect to the JMS provider.*

**spring.jta.bitronix.datasource.acquire-increment**=1 *# Number of connections to create when growing the pool.*

**spring.jta.bitronix.datasource.acquisition-interval**=1 *# Time, in seconds, to wait before trying to acquire a connection again after an invalid connection was acquired.*

**spring.jta.bitronix.datasource.acquisition-timeout**=30 *# Timeout, in seconds, for acquiring connections from the pool.*

**spring.jta.bitronix.datasource.allow-local-transactions**=true *# Whether or not the transaction manager should allow mixing XA and non-XA transactions.*

**spring.jta.bitronix.datasource.apply-transaction-timeout**=false *# Whether or not the transaction timeout should be set on the XAResource when it is enlisted.*

**spring.jta.bitronix.datasource.automatic-enlisting-enabled**=true *# Whether or not resources should be enlisted and delisted automatically.*

**spring.jta.bitronix.datasource.cursor-holdability**= *# The default cursor holdability for connections.*

**spring.jta.bitronix.datasource.defer-connection-release**=true *# Whether or not the database can run many transactions on the same connection and supports transaction interleaving.*

**spring.jta.bitronix.datasource.enable-jdbc4-connection-test**= *# Whether or not Connection.isValid() is called when acquiring a connection from the pool.*

**spring.jta.bitronix.datasource.ignore-recovery-failures**=false *# Whether or not recovery failures should be ignored.*

**spring.jta.bitronix.datasource.isolation-level**= *# The default isolation level for connections.* **spring.jta.bitronix.datasource.local-auto-commit**= *# The default auto-commit mode for local transactions.* **spring.jta.bitronix.datasource.login-timeout**= *# Timeout, in seconds, for establishing a database*

*connection.*

**spring.jta.bitronix.datasource.max-idle-time**=60 *# The time, in seconds, after which connections are cleaned up from the pool.*

**spring.jta.bitronix.datasource.max-pool-size**=10 *# The maximum size of the pool. 0 denotes no limit.* **spring.jta.bitronix.datasource.min-pool-size**=0 *# The minimum size of the pool.* **spring.jta.bitronix.datasource.prepared-statement-cache-size**=0 *# The target size of the prepared*

*statement cache. 0 disables the cache.*

**spring.jta.bitronix.datasource.share-transaction-connections**=false *# Whether or not connections in the ACCESSIBLE state can be shared within the context of a transaction.*

**spring.jta.bitronix.datasource.test-query**= *# SQL query or statement used to validate a connection before returning it.*

**spring.jta.bitronix.datasource.two-pc-ordering-position**=1 *# The position that this resource should take during two-phase commit (always first is Integer.MIN\_VALUE, always last is Integer.MAX\_VALUE).*

**spring.jta.bitronix.datasource.unique-name**=dataSource *# The unique name used to identify the resource during recovery.*

**spring.jta.bitronix.datasource.use-tm-join**=true Whether or not TMJOIN should be used when starting XAResources.

**spring.jta.bitronix.properties.allow-multiple-lrc**=false *# Allow multiple LRC resources to be enlisted into the same transaction.*

**spring.jta.bitronix.properties.asynchronous2-pc**=false *# Enable asynchronously execution of two phase commit.*

**spring.jta.bitronix.properties.background-recovery-interval-seconds**=60 *# Interval in seconds at which to run the recovery process in the background.*

**spring.jta.bitronix.properties.current-node-only-recovery**=true *# Recover only the current node.*

**spring.jta.bitronix.properties.debug-zero-resource-transaction**=false *# Log the creation and commit call stacks of transactions executed without a single enlisted resource.*

**spring.jta.bitronix.properties.default-transaction-timeout**=60 *# Default transaction timeout in seconds.* **spring.jta.bitronix.properties.disable-jmx**=false *# Enable JMX support.* **spring.jta.bitronix.properties.exception-analyzer**= *# Set the fully qualified name of the exception*

*analyzer implementation to use.*

**spring.jta.bitronix.properties.filter-log-status**=false *# Enable filtering of logs so that only mandatory logs are written.*

**spring.jta.bitronix.properties.force-batching-enabled**=true *# Set if disk forces are batched.* **spring.jta.bitronix.properties.forced-write-enabled**=true *# Set if logs are forced to disk.* **spring.jta.bitronix.properties.graceful-shutdown-interval**=60 *# Maximum amount of seconds the TM will*

*wait for transactions to get done before aborting them at shutdown time.*

**spring.jta.bitronix.properties.jndi-transaction-synchronization-registry-name**= *# JNDI name of the TransactionSynchronizationRegistry.*

**spring.jta.bitronix.properties.jndi-user-transaction-name**= *# JNDI name of the UserTransaction.*

**spring.jta.bitronix.properties.journal**=disk *# Name of the journal. Can be 'disk', 'null' or a class name.*

**spring.jta.bitronix.properties.log-part1-filename**=btm1.tlog *# Name of the first fragment of the journal.*

**spring.jta.bitronix.properties.log-part2-filename**=btm2.tlog *# Name of the second fragment of the journal.*

**spring.jta.bitronix.properties.max-log-size-in-mb**=2 *# Maximum size in megabytes of the journal fragments.*

**spring.jta.bitronix.properties.resource-configuration-filename**= *# ResourceLoader configuration file name.*

**spring.jta.bitronix.properties.server-id**= *# ASCII ID that must uniquely identify this TM instance. Default to the machine's IP address.*

**spring.jta.bitronix.properties.skip-corrupted-logs**=false *# Skip corrupted transactions log entries.*

**spring.jta.bitronix.properties.warn-about-zero-resource-transaction**=true *# Log a warning for transactions executed without a single enlisted resource.*

*# NARAYANA (*[NarayanaProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot/src/main/java/org/springframework/boot/jta/narayana/NarayanaProperties.java))

**spring.jta.narayana.default-timeout**=60 *# Transaction timeout in seconds.* **spring.jta.narayana.expiry- scanners**=com.arjuna.ats.internal.arjuna.recovery.ExpiredTransactionStatusManagerScanner *# Comma- separated list of expiry scanners.*

**spring.jta.narayana.log-dir**= *# Transaction object store directory.*

**spring.jta.narayana.one-phase-commit**=true *# Enable one phase commit optimisation.*

**spring.jta.narayana.periodic-recovery-period**=120 *# Interval in which periodic recovery scans are performed in seconds.*

**spring.jta.narayana.recovery-backoff-period**=10 *# Back off period between first and second phases of the recovery scan in seconds.*

**spring.jta.narayana.recovery-db-pass**= *# Database password to be used by recovery manager.* **spring.jta.narayana.recovery-db-user**= *# Database username to be used by recovery manager.* **spring.jta.narayana.recovery-jms-pass**= *# JMS password to be used by recovery manager.* **spring.jta.narayana.recovery-jms-user**= *# JMS username to be used by recovery manager.* **spring.jta.narayana.recovery-modules**= *# Comma-separated list of recovery modules.* **spring.jta.narayana.transaction-manager-id**=1 *# Unique transaction manager id.* **spring.jta.narayana.xa-resource-orphan-filters**= *# Comma-separated list of orphan filters.*

*# EMBEDDED MONGODB (*[EmbeddedMongoProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/mongo/embedded/EmbeddedMongoProperties.java))

**spring.mongodb.embedded.features**=SYNC\_DELAY *# Comma-separated list of features to enable.* **spring.mongodb.embedded.storage.database-dir**= *# Directory used for data storage.* **spring.mongodb.embedded.storage.oplog-size**= *# Maximum size of the oplog in megabytes.* **spring.mongodb.embedded.storage.repl-set-name**= *# Name of the replica set.* **spring.mongodb.embedded.version**=2.6.10 *# Version of Mongo to use.*

*# REDIS (*[RedisProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/data/redis/RedisProperties.java))

**spring.redis.cluster.max-redirects**= *# Maximum number of redirects to follow when executing commands across the cluster.*

**spring.redis.cluster.nodes**= *# Comma-separated list of "host:port" pairs to bootstrap from.*

**spring.redis.database**=0 *# Database index used by the connection factory.*

**spring.redis.url**= *# Connection URL, will override host, port and password (user will be ignored), e.g. redis://user:password@example.com:6379*

**spring.redis.host**=localhost *# Redis server host.* **spring.redis.password**= *# Login password of the redis server.* **spring.redis.ssl**=false *# Enable SSL support.*

**spring.redis.pool.max-active**=8 *# Max number of connections that can be allocated by the pool at a given time. Use a negative value for no limit.*

**spring.redis.pool.max-idle**=8 *# Max number of "idle" connections in the pool. Use a negative value to indicate an unlimited number of idle connections.*

**spring.redis.pool.max-wait**=-1 *# Maximum amount of time (in milliseconds) a connection allocation should block before throwing an exception when the pool is exhausted. Use a negative value to block indefinitely.*

**spring.redis.pool.min-idle**=0 *# Target for the minimum number of idle connections to maintain in the pool. This setting only has an effect if it is positive.*

**spring.redis.port**=6379 *# Redis server port.* **spring.redis.sentinel.master**= *# Name of Redis server.* **spring.redis.sentinel.nodes**= *# Comma-separated list of host:port pairs.* **spring.redis.timeout**=0 *# Connection timeout in milliseconds.*

*# TRANSACTION (*[TransactionProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/transaction/TransactionProperties.java))

**spring.transaction.default-timeout**= *# Default transaction timeout in seconds.*

**spring.transaction.rollback-on-commit-failure**= *# Perform the rollback on commit failures.*

*# ---------------------------------------- # INTEGRATION PROPERTIES*

*# ----------------------------------------*

*# ACTIVEMQ (*[ActiveMQProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jms/activemq/ActiveMQProperties.java))

**spring.activemq.broker-url**= *# URL of the ActiveMQ broker. Auto-generated by default.*

**spring.activemq.close-timeout**=15000 *# Time to wait, in milliseconds, before considering a close complete.*

**spring.activemq.in-memory**=true *# Specify if the default broker URL should be in memory. Ignored if an explicit broker has been specified.*

**spring.activemq.non-blocking-redelivery**=false *# Do not stop message delivery before re-delivering messages from a rolled back transaction. This implies that message order will not be preserved when this is enabled.*

**spring.activemq.password**= *# Login password of the broker.*

**spring.activemq.send-timeout**=0 *# Time to wait, in milliseconds, on Message sends for a response. Set it to 0 to indicate to wait forever.*

**spring.activemq.user**= *# Login user of the broker.*

**spring.activemq.packages.trust-all**= *# Trust all packages.*

**spring.activemq.packages.trusted**= *# Comma-separated list of specific packages to trust (when not trusting all packages).*

**spring.activemq.pool.block-if-full**=true *# Block when a connection is requested and the pool is full. Set it to false to throw a "JMSException" instead.*

**spring.activemq.pool.block-if-full-timeout**=-1 *# Blocking period, in milliseconds, before throwing an exception if the pool is still full.*

**spring.activemq.pool.create-connection-on-startup**=true *# Create a connection on startup. Can be used to warm-up the pool on startup.*

**spring.activemq.pool.enabled**=false *# Whether a PooledConnectionFactory should be created instead of a regular ConnectionFactory.*

**spring.activemq.pool.expiry-timeout**=0 *# Connection expiration timeout in milliseconds.* **spring.activemq.pool.idle-timeout**=30000 *# Connection idle timeout in milliseconds.* **spring.activemq.pool.max-connections**=1 *# Maximum number of pooled connections.* **spring.activemq.pool.maximum-active-session-per-connection**=500 *# Maximum number of active sessions per*

*connection.*

**spring.activemq.pool.reconnect-on-exception**=true *# Reset the connection when a "JMXException" occurs.*

**spring.activemq.pool.time-between-expiration-check**=-1 *# Time to sleep, in milliseconds, between runs of the idle connection eviction thread. When negative, no idle connection eviction thread runs.*

**spring.activemq.pool.use-anonymous-producers**=true *# Use only one anonymous "MessageProducer" instance. Set it to false to create one "MessageProducer" every time one is required.*

*# ARTEMIS (*[ArtemisProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jms/artemis/ArtemisProperties.java))

**spring.artemis.embedded.cluster-password**= *# Cluster password. Randomly generated on startup by default.*

**spring.artemis.embedded.data-directory**= *# Journal file directory. Not necessary if persistence is turned off.*

**spring.artemis.embedded.enabled**=true *# Enable embedded mode if the Artemis server APIs are available.*

**spring.artemis.embedded.persistent**=false *# Enable persistent store.* **spring.artemis.embedded.queues**= *# Comma-separated list of queues to create on startup.* **spring.artemis.embedded.server-id**= *# Server id. By default, an auto-incremented counter is used.* **spring.artemis.embedded.topics**= *# Comma-separated list of topics to create on startup.* **spring.artemis.host**=localhost *# Artemis broker host.*

**spring.artemis.mode**= *# Artemis deployment mode, auto-detected by default.* **spring.artemis.password**= *# Login password of the broker.* **spring.artemis.port**=61616 *# Artemis broker port.*

**spring.artemis.user**= *# Login user of the broker.*

*# SPRING BATCH (*[BatchProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/batch/BatchProperties.java))

**spring.batch.initializer.enabled**= *# Create the required batch tables on startup if necessary. Enabled automatically if no custom table prefix is set or if a custom schema is configured.*

**spring.batch.job.enabled**=true *# Execute all Spring Batch jobs in the context on startup.*

**spring.batch.job.names**= *# Comma-separated list of job names to execute on startup (For instance*

*`job1,job2`). By default, all Jobs found in the context are executed.*

[**spring.batch.schema**=classpath:org/springframework/batch/core/schema-@@platform@@.sql](mailto:org/springframework/batch/core/schema-@@platform@@.sql) *# Path to the SQL file to use to initialize the database schema.*

**spring.batch.table-prefix**= *# Table prefix for all the batch meta-data tables.*

*# JMS (*[JmsProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jms/JmsProperties.java))

**spring.jms.jndi-name**= *# Connection factory JNDI name. When set, takes precedence to others connection factory auto-configurations.*

**spring.jms.listener.acknowledge-mode**= *# Acknowledge mode of the container. By default, the listener is transacted with automatic acknowledgment.*

**spring.jms.listener.auto-startup**=true *# Start the container automatically on startup.* **spring.jms.listener.concurrency**= *# Minimum number of concurrent consumers.* **spring.jms.listener.max-concurrency**= *# Maximum number of concurrent consumers.* **spring.jms.pub-sub-domain**=false *# Specify if the default destination type is topic.*

**spring.jms.template.default-destination**= *# Default destination to use on send/receive operations that do not have a destination parameter.*

**spring.jms.template.delivery-delay**= *# Delivery delay to use for send calls in milliseconds.* **spring.jms.template.delivery-mode**= *# Delivery mode. Enable QoS when set.* **spring.jms.template.priority**= *# Priority of a message when sending. Enable QoS when set.* **spring.jms.template.qos-enabled**= *# Enable explicit QoS when sending a message.* **spring.jms.template.receive-timeout**= *# Timeout to use for receive calls in milliseconds.*

**spring.jms.template.time-to-live**= *# Time-to-live of a message when sending in milliseconds. Enable QoS when set.*

*# APACHE KAFKA (*[KafkaProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/kafka/KafkaProperties.java))

**spring.kafka.bootstrap-servers**= *# Comma-delimited list of host:port pairs to use for establishing the initial connection to the Kafka cluster.*

**spring.kafka.client-id**= *# Id to pass to the server when making requests; used for server-side logging.*

**spring.kafka.consumer.auto-commit-interval**= *# Frequency in milliseconds that the consumer offsets are auto-committed to Kafka if 'enable.auto.commit' true.*

**spring.kafka.consumer.auto-offset-reset**= *# What to do when there is no initial offset in Kafka or if the current offset does not exist any more on the server.*

**spring.kafka.consumer.bootstrap-servers**= *# Comma-delimited list of host:port pairs to use for establishing the initial connection to the Kafka cluster.*

**spring.kafka.consumer.client-id**= *# Id to pass to the server when making requests; used for server-side logging.*

**spring.kafka.consumer.enable-auto-commit**= *# If true the consumer's offset will be periodically committed in the background.*

**spring.kafka.consumer.fetch-max-wait**= *# Maximum amount of time in milliseconds the server will block before answering the fetch request if there isn't sufficient data to immediately satisfy the requirement given by "fetch.min.bytes".*

**spring.kafka.consumer.fetch-min-size**= *# Minimum amount of data the server should return for a fetch request in bytes.*

**spring.kafka.consumer.group-id**= *# Unique string that identifies the consumer group this consumer belongs to.*

**spring.kafka.consumer.heartbeat-interval**= *# Expected time in milliseconds between heartbeats to the consumer coordinator.*

**spring.kafka.consumer.key-deserializer**= *# Deserializer class for keys.*

**spring.kafka.consumer.max-poll-records**= *# Maximum number of records returned in a single call to poll().*

**spring.kafka.consumer.value-deserializer**= *# Deserializer class for values.*

**spring.kafka.listener.ack-count**= *# Number of records between offset commits when ackMode is "COUNT" or "COUNT\_TIME".*

**spring.kafka.listener.ack-mode**= *# Listener AckMode; see the spring-kafka documentation.*

**spring.kafka.listener.ack-time**= *# Time in milliseconds between offset commits when ackMode is "TIME" or "COUNT\_TIME".*

**spring.kafka.listener.concurrency**= *# Number of threads to run in the listener containers.* **spring.kafka.listener.poll-timeout**= *# Timeout in milliseconds to use when polling the consumer.* **spring.kafka.producer.acks**= *# Number of acknowledgments the producer requires the leader to have*

*received before considering a request complete.*

**spring.kafka.producer.batch-size**= *# Number of records to batch before sending.*

**spring.kafka.producer.bootstrap-servers**= *# Comma-delimited list of host:port pairs to use for establishing the initial connection to the Kafka cluster.*

**spring.kafka.producer.buffer-memory**= *# Total bytes of memory the producer can use to buffer records waiting to be sent to the server.*

**spring.kafka.producer.client-id**= *# Id to pass to the server when making requests; used for server-side logging.*

**spring.kafka.producer.compression-type**= *# Compression type for all data generated by the producer.*

**spring.kafka.producer.key-serializer**= *# Serializer class for keys.* **spring.kafka.producer.retries**= *# When greater than zero, enables retrying of failed sends.* **spring.kafka.producer.value-serializer**= *# Serializer class for values.* **spring.kafka.properties.\***= *# Additional properties used to configure the client.* **spring.kafka.ssl.key-password**= *# Password of the private key in the key store file.* **spring.kafka.ssl.keystore-location**= *# Location of the key store file.* **spring.kafka.ssl.keystore-password**= *# Store password for the key store file.* **spring.kafka.ssl.truststore-location**= *# Location of the trust store file.* **spring.kafka.ssl.truststore-password**= *# Store password for the trust store file.* **spring.kafka.template.default-topic**= *# Default topic to which messages will be sent.*

*# RABBIT (*[RabbitProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/amqp/RabbitProperties.java))

**spring.rabbitmq.addresses**= *# Comma-separated list of addresses to which the client should connect.*

**spring.rabbitmq.cache.channel.checkout-timeout**= *# Number of milliseconds to wait to obtain a channel if the cache size has been reached.*

**spring.rabbitmq.cache.channel.size**= *# Number of channels to retain in the cache.* **spring.rabbitmq.cache.connection.mode**=channel *# Connection factory cache mode.* **spring.rabbitmq.cache.connection.size**= *# Number of connections to cache.* **spring.rabbitmq.connection-timeout**= *# Connection timeout, in milliseconds; zero for infinite.* **spring.rabbitmq.dynamic**=true *# Create an AmqpAdmin bean.*

**spring.rabbitmq.host**=localhost *# RabbitMQ host.*

**spring.rabbitmq.listener.simple.acknowledge-mode**= *# Acknowledge mode of container.* **spring.rabbitmq.listener.simple.auto-startup**=true *# Start the container automatically on startup.* **spring.rabbitmq.listener.simple.concurrency**= *# Minimum number of consumers.* **spring.rabbitmq.listener.simple.default-requeue-rejected**= *# Whether or not to requeue delivery failures;*

*default `true`.*

**spring.rabbitmq.listener.simple.idle-event-interval**= *# How often idle container events should be published in milliseconds.*

**spring.rabbitmq.listener.simple.max-concurrency**= *# Maximum number of consumers.*

**spring.rabbitmq.listener.simple.prefetch**= *# Number of messages to be handled in a single request. It should be greater than or equal to the transaction size (if used).*

**spring.rabbitmq.listener.simple.retry.enabled**=false *# Whether or not publishing retries are enabled.*

**spring.rabbitmq.listener.simple.retry.initial-interval**=1000 *# Interval between the first and second attempt to deliver a message.*

**spring.rabbitmq.listener.simple.retry.max-attempts**=3 *# Maximum number of attempts to deliver a message.* **spring.rabbitmq.listener.simple.retry.max-interval**=10000 *# Maximum interval between attempts.* **spring.rabbitmq.listener.simple.retry.multiplier**=1.0 *# A multiplier to apply to the previous delivery*

*retry interval.*

**spring.rabbitmq.listener.simple.retry.stateless**=true *# Whether or not retry is stateless or stateful.*

**spring.rabbitmq.listener.simple.transaction-size**= *# Number of messages to be processed in a transaction. For best results it should be less than or equal to the prefetch count.*

**spring.rabbitmq.password**= *# Login to authenticate against the broker.*

**spring.rabbitmq.port**=5672 *# RabbitMQ port.*

**spring.rabbitmq.publisher-confirms**=false *# Enable publisher confirms.*

**spring.rabbitmq.publisher-returns**=false *# Enable publisher returns.*

**spring.rabbitmq.requested-heartbeat**= *# Requested heartbeat timeout, in seconds; zero for none.*

**spring.rabbitmq.ssl.enabled**=false *# Enable SSL support.*

**spring.rabbitmq.ssl.key-store**= *# Path to the key store that holds the SSL certificate.* **spring.rabbitmq.ssl.key-store-password**= *# Password used to access the key store.* **spring.rabbitmq.ssl.trust-store**= *# Trust store that holds SSL certificates.* **spring.rabbitmq.ssl.trust-store-password**= *# Password used to access the trust store.* **spring.rabbitmq.ssl.algorithm**= *# SSL algorithm to use. By default configure by the rabbit client*

*library.*

**spring.rabbitmq.template.mandatory**=false *# Enable mandatory messages.* **spring.rabbitmq.template.receive-timeout**=0 *# Timeout for `receive()` methods.* **spring.rabbitmq.template.reply-timeout**=5000 *# Timeout for `sendAndReceive()` methods.* **spring.rabbitmq.template.retry.enabled**=false *# Set to true to enable retries in the `RabbitTemplate`.*

**spring.rabbitmq.template.retry.initial-interval**=1000 *# Interval between the first and second attempt to publish a message.*

**spring.rabbitmq.template.retry.max-attempts**=3 *# Maximum number of attempts to publish a message.* **spring.rabbitmq.template.retry.max-interval**=10000 *# Maximum number of attempts to publish a message.* **spring.rabbitmq.template.retry.multiplier**=1.0 *# A multiplier to apply to the previous publishing retry*

*interval.*

**spring.rabbitmq.username**= *# Login user to authenticate to the broker.*

**spring.rabbitmq.virtual-host**= *# Virtual host to use when connecting to the broker.*

*# ---------------------------------------- # ACTUATOR PROPERTIES*

*# ----------------------------------------*

*# ENDPOINTS (*[AbstractEndpoint](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/endpoint/AbstractEndpoint.java) subclasses) **endpoints.enabled**=true *# Enable endpoints.* **endpoints.sensitive**= *# Default endpoint sensitive setting.* **endpoints.actuator.enabled**=true *# Enable the endpoint.* **endpoints.actuator.path**= *# Endpoint URL path.*

**endpoints.actuator.sensitive**=false *# Enable security on the endpoint.* **endpoints.auditevents.enabled**= *# Enable the endpoint.* **endpoints.auditevents.path**= *# Endpoint path.* **endpoints.auditevents.sensitive**=false *# Enable security on the endpoint.* **endpoints.autoconfig.enabled**= *# Enable the endpoint.* **endpoints.autoconfig.id**= *# Endpoint identifier.* **endpoints.autoconfig.path**= *# Endpoint path.*

**endpoints.autoconfig.sensitive**= *# Mark if the endpoint exposes sensitive information.*

**endpoints.beans.enabled**= *# Enable the endpoint.* **endpoints.beans.id**= *# Endpoint identifier.* **endpoints.beans.path**= *# Endpoint path.*

**endpoints.beans.sensitive**= *# Mark if the endpoint exposes sensitive information.*

**endpoints.configprops.enabled**= *# Enable the endpoint.*

**endpoints.configprops.id**= *# Endpoint identifier.*

**endpoints.configprops.keys-to-sanitize**=password,secret,key,token,.\*credentials.\*,vcap\_services *# Keys that should be sanitized. Keys can be simple strings that the property ends with or regex expressions.*

**endpoints.configprops.path**= *# Endpoint path.*

**endpoints.configprops.sensitive**= *# Mark if the endpoint exposes sensitive information.* **endpoints.docs.curies.enabled**=false *# Enable the curie generation.* **endpoints.docs.enabled**=true *# Enable actuator docs endpoint.*

**endpoints.docs.path**=/docs *#* **endpoints.docs.sensitive**=false *#* **endpoints.dump.enabled**= *# Enable the endpoint.* **endpoints.dump.id**= *# Endpoint identifier.* **endpoints.dump.path**= *# Endpoint path.*

**endpoints.dump.sensitive**= *# Mark if the endpoint exposes sensitive information.*

**endpoints.env.enabled**= *# Enable the endpoint.*

**endpoints.env.id**= *# Endpoint identifier.*

**endpoints.env.keys-to-sanitize**=password,secret,key,token,.\*credentials.\*,vcap\_services *# Keys that should be sanitized. Keys can be simple strings that the property ends with or regex expressions.*

**endpoints.env.path**= *# Endpoint path.*

**endpoints.env.sensitive**= *# Mark if the endpoint exposes sensitive information.*

**endpoints.flyway.enabled**= *# Enable the endpoint.*

**endpoints.flyway.id**= *# Endpoint identifier.*

**endpoints.flyway.sensitive**= *# Mark if the endpoint exposes sensitive information.*

**endpoints.health.enabled**= *# Enable the endpoint.*

**endpoints.health.id**= *# Endpoint identifier.*

**endpoints.health.mapping.\***= *# Mapping of health statuses to HTTP status codes. By default, registered health statuses map to sensible defaults (i.e. UP maps to 200).*

**endpoints.health.path**= *# Endpoint path.*

**endpoints.health.sensitive**= *# Mark if the endpoint exposes sensitive information.* **endpoints.health.time-to-live**=1000 *# Time to live for cached result, in milliseconds.* **endpoints.heapdump.enabled**= *# Enable the endpoint.*

**endpoints.heapdump.path**= *# Endpoint path.*

**endpoints.heapdump.sensitive**= *# Mark if the endpoint exposes sensitive information.* **endpoints.hypermedia.enabled**=false *# Enable hypermedia support for endpoints.* **endpoints.info.enabled**= *# Enable the endpoint.*

**endpoints.info.id**= *# Endpoint identifier.*

**endpoints.info.path**= *# Endpoint path.*

**endpoints.info.sensitive**= *# Mark if the endpoint exposes sensitive information.* **endpoints.jolokia.enabled**=true *# Enable Jolokia endpoint.* **endpoints.jolokia.path**=/jolokia *# Endpoint URL path.* **endpoints.jolokia.sensitive**=true *# Enable security on the endpoint.* **endpoints.liquibase.enabled**= *# Enable the endpoint.*

**endpoints.liquibase.id**= *# Endpoint identifier.*

**endpoints.liquibase.sensitive**= *# Mark if the endpoint exposes sensitive information.*

**endpoints.logfile.enabled**=true *# Enable the endpoint.* **endpoints.logfile.external-file**= *# External Logfile to be accessed.* **endpoints.logfile.path**=/logfile *# Endpoint URL path.* **endpoints.logfile.sensitive**=true *# Enable security on the endpoint.* **endpoints.loggers.enabled**=true *# Enable the endpoint.* **endpoints.loggers.id**= *# Endpoint identifier.* **endpoints.loggers.path**=/logfile *# Endpoint path.*

**endpoints.loggers.sensitive**=true *# Mark if the endpoint exposes sensitive information.*

**endpoints.mappings.enabled**= *# Enable the endpoint.* **endpoints.mappings.id**= *# Endpoint identifier.* **endpoints.mappings.path**= *# Endpoint path.*

**endpoints.mappings.sensitive**= *# Mark if the endpoint exposes sensitive information.* **endpoints.metrics.enabled**= *# Enable the endpoint.* **endpoints.metrics.filter.enabled**=true *# Enable the metrics servlet filter.*

**endpoints.metrics.filter.gauge-submissions**=merged *# Http filter gauge submissions (merged, per-http- method)*

**endpoints.metrics.filter.counter-submissions**=merged *# Http filter counter submissions (merged, per-http- method)*

**endpoints.metrics.id**= *# Endpoint identifier.*

**endpoints.metrics.path**= *# Endpoint path.*

**endpoints.metrics.sensitive**= *# Mark if the endpoint exposes sensitive information.*

**endpoints.shutdown.enabled**= *# Enable the endpoint.*

**endpoints.shutdown.id**= *# Endpoint identifier.*

**endpoints.shutdown.path**= *# Endpoint path.*

**endpoints.shutdown.sensitive**= *# Mark if the endpoint exposes sensitive information.*

**endpoints.trace.enabled**= *# Enable the endpoint.* **endpoints.trace.filter.enabled**=true *# Enable the trace servlet filter.* **endpoints.trace.id**= *# Endpoint identifier.*

**endpoints.trace.path**= *# Endpoint path.*

**endpoints.trace.sensitive**= *# Mark if the endpoint exposes sensitive information.*

*# ENDPOINTS CORS CONFIGURATION (*[EndpointCorsProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/EndpointCorsProperties.java))

**endpoints.cors.allow-credentials**= *# Set whether credentials are supported. When not set, credentials are not supported.*

**endpoints.cors.allowed-headers**= *# Comma-separated list of headers to allow in a request. '\*' allows all headers.*

**endpoints.cors.allowed-methods**=GET *# Comma-separated list of methods to allow. '\*' allows all methods.*

**endpoints.cors.allowed-origins**= *# Comma-separated list of origins to allow. '\*' allows all origins. When not set, CORS support is disabled.*

**endpoints.cors.exposed-headers**= *# Comma-separated list of headers to include in a response.*

**endpoints.cors.max-age**=1800 *# How long, in seconds, the response from a pre-flight request can be cached by clients.*

*# JMX ENDPOINT (*[EndpointMBeanExportProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/EndpointMBeanExportProperties.java))

**endpoints.jmx.domain**= *# JMX domain name. Initialized with the value of 'spring.jmx.default-domain' if set.*

**endpoints.jmx.enabled**=true *# Enable JMX export of all endpoints.*

**endpoints.jmx.static-names**= *# Additional static properties to append to all ObjectNames of MBeans representing Endpoints.*

**endpoints.jmx.unique-names**=false *# Ensure that ObjectNames are modified in case of conflict.*

*# JOLOKIA (*[JolokiaProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/JolokiaProperties.java))

**jolokia.config.\***= *# See Jolokia manual*

*# MANAGEMENT HTTP SERVER (*[ManagementServerProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/ManagementServerProperties.java))

**management.add-application-context-header**=true *# Add the "X-Application-Context" HTTP header in each response.*

**management.address**= *# Network address that the management endpoints should bind to.* **management.context-path**= *# Management endpoint context-path. For instance `/actuator`* **management.cloudfoundry.enabled**= *# Enable extended Cloud Foundry actuator endpoints*

**management.cloudfoundry.skip-ssl-validation**= *# Skip SSL verification for Cloud Foundry actuator endpoint security calls*

**management.port**= *# Management endpoint HTTP port. Uses the same port as the application by default. Configure a different port to use management-specific SSL.*

**management.security.enabled**=true *# Enable security.*

**management.security.roles**=ACTUATOR *# Comma-separated list of roles that can access the management endpoint.*

**management.security.sessions**=stateless *# Session creating policy to use (always, never, if\_required, stateless).*

**management.ssl.ciphers**= *# Supported SSL ciphers. Requires a custom management.port.*

**management.ssl.client-auth**= *# Whether client authentication is wanted ("want") or needed ("need"). Requires a trust store. Requires a custom management.port.*

**management.ssl.enabled**= *# Enable SSL support. Requires a custom management.port.* **management.ssl.enabled-protocols**= *# Enabled SSL protocols. Requires a custom management.port.* **management.ssl.key-alias**= *# Alias that identifies the key in the key store. Requires a custom*

*management.port.*

**management.ssl.key-password**= *# Password used to access the key in the key store. Requires a custom management.port.*

**management.ssl.key-store**= *# Path to the key store that holds the SSL certificate (typically a jks file). Requires a custom management.port.*

**management.ssl.key-store-password**= *# Password used to access the key store. Requires a custom management.port.*

**management.ssl.key-store-provider**= *# Provider for the key store. Requires a custom management.port.* **management.ssl.key-store-type**= *# Type of the key store. Requires a custom management.port.* **management.ssl.protocol**=TLS *# SSL protocol to use. Requires a custom management.port.* **management.ssl.trust-store**= *# Trust store that holds SSL certificates. Requires a custom*

*management.port.*

**management.ssl.trust-store-password**= *# Password used to access the trust store. Requires a custom management.port.*

**management.ssl.trust-store-provider**= *# Provider for the trust store. Requires a custom management.port.*

**management.ssl.trust-store-type**= *# Type of the trust store. Requires a custom management.port. # HEALTH INDICATORS*

**management.health.db.enabled**=true *# Enable database health check.* **management.health.cassandra.enabled**=true *# Enable cassandra health check.* **management.health.couchbase.enabled**=true *# Enable couchbase health check.* **management.health.defaults.enabled**=true *# Enable default health indicators.* **management.health.diskspace.enabled**=true *# Enable disk space health check.* **management.health.diskspace.path**= *# Path used to compute the available disk space.* **management.health.diskspace.threshold**=0 *# Minimum disk space that should be available, in bytes.* **management.health.elasticsearch.enabled**=true *# Enable elasticsearch health check.* **management.health.elasticsearch.indices**= *# Comma-separated index names.* **management.health.elasticsearch.response-timeout**=100 *# The time, in milliseconds, to wait for a response*

*from the cluster.*

**management.health.jms.enabled**=true *# Enable JMS health check.* **management.health.ldap.enabled**=true *# Enable LDAP health check.* **management.health.mail.enabled**=true *# Enable Mail health check.* **management.health.mongo.enabled**=true *# Enable MongoDB health check.* **management.health.rabbit.enabled**=true *# Enable RabbitMQ health check.* **management.health.redis.enabled**=true *# Enable Redis health check.* **management.health.solr.enabled**=true *# Enable Solr health check.*

**management.health.status.order**=DOWN, OUT\_OF\_SERVICE, UP, UNKNOWN *# Comma-separated list of health statuses in order of severity.*

*# INFO CONTRIBUTORS (*[InfoContributorProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/InfoContributorProperties.java)) **management.info.build.enabled**=true *# Enable build info.* **management.info.defaults.enabled**=true *# Enable default info contributors.* **management.info.env.enabled**=true *# Enable environment info.* **management.info.git.enabled**=true *# Enable git info.* **management.info.git.mode**=simple *# Mode to use to expose git information.*

*# REMOTE SHELL (*[ShellProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/ShellProperties.java))

**management.shell.auth.type**=simple *# Authentication type. Auto-detected according to the environment.*

**management.shell.auth.jaas.domain**=my-domain *# JAAS domain.*

**management.shell.auth.key.path**= *# Path to the authentication key. This should point to a valid ".pem" file.*

**management.shell.auth.simple.user.name**=user *# Login user.* **management.shell.auth.simple.user.password**= *# Login password.* **management.shell.auth.spring.roles**=ACTUATOR *# Comma-separated list of required roles to login to the*

*CRaSH console.*

**management.shell.command-path-patterns**=classpath\*:/commands/\*\*,classpath\*:/crash/commands/\*\* *# Patterns to use to look for commands.*

**management.shell.command-refresh-interval**=-1 *# Scan for changes and update the command if necessary (in seconds).*

**management.shell.config-path-patterns**=classpath\*:/crash/\* *# Patterns to use to look for configurations.* **management.shell.disabled-commands**=jpa\*,jdbc\*,jndi\* *# Comma-separated list of commands to disable.* **management.shell.disabled-plugins**= *# Comma-separated list of plugins to disable. Certain plugins are*

*disabled by default based on the environment.*

**management.shell.ssh.auth-timeout** = *# Number of milliseconds after user will be prompted to login again.*

**management.shell.ssh.enabled**=true *# Enable CRaSH SSH support.*

**management.shell.ssh.idle-timeout** = *# Number of milliseconds after which unused connections are closed.*

**management.shell.ssh.key-path**= *# Path to the SSH server key.*

**management.shell.ssh.port**=2000 *# SSH port.*

**management.shell.telnet.enabled**=false *# Enable CRaSH telnet support. Enabled by default if the TelnetPlugin is available.*

**management.shell.telnet.port**=5000 *# Telnet port.*

*# TRACING (*[TraceProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/trace/TraceProperties.java))

**management.trace.include**=request-headers,response-headers,cookies,errors *# Items to be included in the trace.*

*# METRICS EXPORT (*[MetricExportProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/metrics/export/MetricExportProperties.java))

**spring.metrics.export.aggregate.key-pattern**= *# Pattern that tells the aggregator what to do with the keys from the source repository.*

**spring.metrics.export.aggregate.prefix**= *# Prefix for global repository if active.*

**spring.metrics.export.delay-millis**=5000 *# Delay in milliseconds between export ticks. Metrics are exported to external sources on a schedule with this delay.*

**spring.metrics.export.enabled**=true *# Flag to enable metric export (assuming a MetricWriter is available).*

**spring.metrics.export.excludes**= *# List of patterns for metric names to exclude. Applied after the includes.*

**spring.metrics.export.includes**= *# List of patterns for metric names to include.* **spring.metrics.export.redis.key**=keys.spring.metrics *# Key for redis repository export (if active).* **spring.metrics.export.redis.prefix**=spring.metrics *# Prefix for redis repository if active.*

**spring.metrics.export.send-latest**= *# Flag to switch off any available optimizations based on not exporting unchanged metric values.*

**spring.metrics.export.statsd.host**= *# Host of a statsd server to receive exported metrics.* **spring.metrics.export.statsd.port**=8125 *# Port of a statsd server to receive exported metrics.* **spring.metrics.export.statsd.prefix**= *# Prefix for statsd exported metrics.* **spring.metrics.export.triggers.\***= *# Specific trigger properties per MetricWriter bean name.*

*# ---------------------------------------- # DEVTOOLS PROPERTIES*

*# ----------------------------------------*

*# DEVTOOLS (*[DevToolsProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-devtools/src/main/java/org/springframework/boot/devtools/autoconfigure/DevToolsProperties.java))

**spring.devtools.livereload.enabled**=true *# Enable a livereload.com compatible server.*

**spring.devtools.livereload.port**=35729 *# Server port.*

**spring.devtools.restart.additional-exclude**= *# Additional patterns that should be excluded from triggering a full restart.*

**spring.devtools.restart.additional-paths**= *# Additional paths to watch for changes.*

**spring.devtools.restart.enabled**=true *# Enable automatic restart.*

**spring.devtools.restart.exclude**=META-INF/maven/\*\*,META-INF/resources/\*\*,resources/\*\*,static/\*\*,public/

\*\*,templates/\*\*,\*\*/\*Test.class,\*\*/\*Tests.class,git.properties *# Patterns that should be excluded from triggering a full restart.*

**spring.devtools.restart.poll-interval**=1000 *# Amount of time (in milliseconds) to wait between polling for classpath changes.*

**spring.devtools.restart.quiet-period**=400 *# Amount of quiet time (in milliseconds) required without any classpath changes before a restart is triggered.*

**spring.devtools.restart.trigger-file**= *# Name of a specific file that when changed will trigger the restart check. If not specified any classpath file change will trigger the restart.*

*# REMOTE DEVTOOLS (*[RemoteDevToolsProperties](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-devtools/src/main/java/org/springframework/boot/devtools/autoconfigure/RemoteDevToolsProperties.java))

**spring.devtools.remote.context-path**=/.~~spring-boot!~ *# Context path used to handle the remote connection.*

**spring.devtools.remote.debug.enabled**=true *# Enable remote debug support.* **spring.devtools.remote.debug.local-port**=8000 *# Local remote debug server port.* **spring.devtools.remote.proxy.host**= *# The host of the proxy to use to connect to the remote application.* **spring.devtools.remote.proxy.port**= *# The port of the proxy to use to connect to the remote application.* **spring.devtools.remote.restart.enabled**=true *# Enable remote restart.*

**spring.devtools.remote.secret**= *# A shared secret required to establish a connection (required to enable remote support).*

**spring.devtools.remote.secret-header-name**=X-AUTH-TOKEN *# HTTP header used to transfer the shared secret.*

*# ---------------------------------------- # TESTING PROPERTIES*

*# ----------------------------------------*

**spring.test.database.replace**=any *# Type of existing DataSource to replace.*

**spring.test.mockmvc.print**=default *# MVC Print option.*

**Appendix B. Configuration meta-data**

Spring Boot jars are shipped with meta-data files that provide details of all supported configuration properties. The files are designed to allow IDE developers to offer contextual help and “code completion” as users are working with application.properties or application.yml files.

The majority of the meta-data file is generated automatically at compile time by processing all items annotated with @ConfigurationProperties. However, it is possible to [write part of the meta-data](#_bookmark588) [manually](#_bookmark588) for corner cases or more advanced use cases.

## Meta-data format

Configuration meta-data files are located inside jars under META-INF/spring-configuration- metadata.json They use a simple JSON format with items categorized under either “groups” or “properties” and additional values hint categorized under "hints":

{***"groups"***: **[**

**{**

***"name"***: ***"server"*,**

***"type"***: ***"org.springframework.boot.autoconfigure.web.ServerProperties"*, *"sourceType"***: ***"org.springframework.boot.autoconfigure.web.ServerProperties"***

**},**

**{**

***"name"***: ***"spring.jpa.hibernate"*,**

***"type"***: ***"org.springframework.boot.autoconfigure.orm.jpa.JpaProperties$Hibernate"*, *"sourceType"***: ***"org.springframework.boot.autoconfigure.orm.jpa.JpaProperties"*, *"sourceMethod"***: ***"getHibernate()"***

**}**

...

],***"properties"***: **[**

**{**

***"name"***: ***"server.port"*, *"type"***: ***"java.lang.Integer"*,**

***"sourceType"***: ***"org.springframework.boot.autoconfigure.web.ServerProperties"***

**},**

**{**

***"name"***: ***"server.servlet-path"*, *"type"***: ***"java.lang.String"*,**

***"sourceType"***: ***"org.springframework.boot.autoconfigure.web.ServerProperties"*, *"defaultValue"***: ***"/"***

**},**

**{**

***"name"***: ***"spring.jpa.hibernate.ddl-auto"*, *"type"***: ***"java.lang.String"*,**

***"description"***: ***"DDL mode. This is actually a shortcut for the \"hibernate.hbm2ddl.auto\" property."*,**

***"sourceType"***: ***"org.springframework.boot.autoconfigure.orm.jpa.JpaProperties$Hibernate"***

**}**

...

],***"hints"***: **[**

**{**

***"name"***: ***"spring.jpa.hibernate.ddl-auto"*, *"values"***: **[**

**{**

***"value"***: ***"none"*,**

***"description"***: ***"Disable DDL handling."***

**},**

**{**

***"value"***: ***"validate"*,**

***"description"***: ***"Validate the schema, make no changes to the database."***

**},**

**{**

***"value"***: ***"update"*,**

***"description"***: ***"Update the schema if necessary."***

**},**

**{**

***"value"***: ***"create"*,**

***"description"***: ***"Create the schema and destroy previous data."***

**},**

**{**

***"value"***: ***"create-drop"*,**

***"description"***: ***"Create and then destroy the schema at the end of the session."***

**}**

**]**

**}**

]**}**

Each “property” is a configuration item that the user specifies with a given value. For example server.port and server.servlet-path might be specified in application.properties as follows:

**server.port**=9090 **server.servlet-path**=/home

The “groups” are higher level items that don’t themselves specify a value, but instead provide a contextual grouping for properties. For example the server.port and server.servlet-path properties are part of the server group.

**Note**

It is not required that every “property” has a “group”, some properties might just exist in their own right.

Finally, “hints” are additional information used to assist the user in configuring a given property. When configuring the spring.jpa.hibernate.ddl-auto property, a tool can use it to offer some auto- completion help for the none, validate, update, create and create-drop values.

### Group Attributes

The JSON object contained in the groups array can contain the following attributes:

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Purpose** |
| name type | String String | The full name of the group. This attribute is mandatory.  The class name of the data type of the group. For example, if the group was based on a class annotated with  @ConfigurationProperties the attribute would contain the fully qualified name of that class. If it was based on a @Bean method, it would be the return type of that method. The attribute may be omitted if the type is not known. |
| description | String | A short description of the group that can be displayed to users. May be omitted if no description is available. It is recommended that descriptions are a short paragraphs, with the first line providing a concise summary. The last line in the description should end with a period (.). |
| sourceType | String | The class name of the source that contributed this group. For example, if the group was based on a @Bean method annotated |

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Purpose** |
| sourceMetho | d String | with @ConfigurationProperties this attribute would contain the fully qualified name of the @Configuration class containing the method. The attribute may be omitted if the source type is not known.  The full name of the method (include parenthesis and argument types) that contributed this group. For example, the name of a @ConfigurationProperties annotated @Bean method. May be omitted if the source method is not known. |

### Property Attributes

The JSON object contained in the properties array can contain the following attributes:

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Purpose** |
| name | String | The full name of the property. Names are in lowercase dashed form (e.g. server.servlet-path). This attribute is mandatory. |
| type | String | The full signature of the data type of the property. For example, java.lang.String but also a full generic type such as java.util.Map<java.util.String,acme.MyEnum>. This attribute can be used to guide the user as to the types of values that they can enter. For consistency, the type of a primitive is specified using its wrapper counterpart, i.e. boolean becomes java.lang.Boolean. Note that this class may be a complex type that gets converted from a String as values are bound. May be omitted if the type is not known. |
| description  sourceType | String  String | A short description of the group that can be displayed to users. May be omitted if no description is available. It is recommended that descriptions are a short paragraphs, with the first line providing a concise summary. The last line in the description should end with a period (.).  The class name of the source that contributed this property.  For example, if the property was from a class annotated with @ConfigurationProperties this attribute would contain the fully qualified name of that class. May be omitted if the source type is not known. |
| defaultValu | e Object | The default value which will be used if the property is not specified. Can also be an array of value(s) if the type of the property is an array. May be omitted if the default value is not known. |
| deprecation | Deprecation | Specify if the property is deprecated. May be omitted if the field is not deprecated or if that information is not known. See below for more details. |

The JSON object contained in the deprecation attribute of each properties element can contain the following attributes:

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Purpose** |
| level  reason | String  String | The level of deprecation, can be either warning (default) or error. When a property has a warning deprecation level it should still be bound in the environment. When it has an error deprecation level however, the property is no longer managed and will not be bound.  A short description of the reason why the property was deprecated. May be omitted if no reason is available. It is recommended that descriptions are a short paragraphs, with the first line providing a concise summary. The last line in the description should end with a period (.). |
| replacement | String | The full name of the property that is *replacing* this deprecated property. May be omitted if there is no replacement for this property. |

**Note**

Prior to Spring Boot 1.3, a single deprecated boolean attribute can be used instead of the deprecation element. This is still supported in a deprecated fashion and should no longer be used. If no reason and replacement are available, an empty deprecation object should be set.

Deprecation can also be specified declaratively in code by adding the @DeprecatedConfigurationProperty annotation to the getter exposing the deprecated property. For instance, let’s assume the app.foo.target property was confusing and was renamed to app.foo.name

@ConfigurationProperties("app.foo")

**public class** FooProperties {

**private** String name;

**public** String getName() { ... }

**public void** setName(String name) { ... }

@DeprecatedConfigurationProperty(replacement = "app.foo.name") @Deprecated

**public** String getTarget() {

**return** getName();

}

@Deprecated

**public void** setTarget(String target) { setName(target);

}

}

**Note**

There is no way to set a level as warning is always assumed since code is still handling the property.

The code above makes sure that the deprecated property still works (delegating to the name property behind the scenes). Once the getTarget and setTarget methods can be removed from your public

API, the automatic deprecation hint in the meta-data will go away as well. If you want to keep a hint, adding manual meta-data with an error deprecation level ensures that users are still informed about that property and is particularly useful when a replacement is provided.

### Hint Attributes

The JSON object contained in the hints array can contain the following attributes:

|  |  |  |
| --- | --- | --- |
| **Name**  name | **Type**  String | **Purpose**  The full name of the property that this hint refers to. Names are in lowercase dashed form (e.g. server.servlet-path). If the property refers to a map (e.g. system.contexts) the hint either applies to the *keys* of the map (system.context.keys) or the  values (system.context.values). This attribute is mandatory. |
| values  providers | ValueHint[]  ValueProvider[] | A list of valid values as defined by the ValueHint object (see below). Each entry defines the value and may have a description  A list of providers as defined by the ValueProvider object (see below). Each entry defines the name of the provider and its parameters, if any. |

The JSON object contained in the values attribute of each hint element can contain the following attributes:

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Purpose** |
| value | Object | A valid value for the element to which the hint refers to. Can also be an array of value(s) if the type of the property is an array. This attribute is mandatory. |
| description | String | A short description of the value that can be displayed to users. May be omitted if no description is available. It is recommended that descriptions are a short paragraphs, with the first line providing a concise summary. The last line in the description should end with a period (.). |

The JSON object contained in the providers attribute of each hint element can contain the following attributes:

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Purpose** |
| name  parameters | String  JSON object | The name of the provider to use to offer additional content assistance for the element to which the hint refers to.  Any additional parameter that the provider supports (check the documentation of the provider for more details). |

### Repeated meta-data items

It is perfectly acceptable for “property” and “group” objects with the same name to appear multiple times within a meta-data file. For example, you could bind two separate classes to the same prefix, with each

potentially offering overlap of property names. While this is not supposed to be a frequent scenario, consumers of meta-data should take care to ensure that they support such scenarios.

## Providing manual hints

To improve the user experience and further assist the user in configuring a given property, you can provide additional meta-data that:

1. Describes the list of potential values for a property.
2. Associates a provider to attach a well-defined semantic to a property so that a tool can discover the list of potential values based on the project’s context.

### Value hint

The name attribute of each hint refers to the name of a property. In the initial example above, we provide 5 values for the spring.jpa.hibernate.ddl-auto property: none, validate, update, create and create-drop. Each value may have a description as well.

If your property is of type Map, you can provide hints for both the keys and the values (but not for the map itself). The special .keys and .values suffixes must be used to refer to the keys and the values respectively.

Let’s assume a foo.contexts that maps magic String values to an integer:

@ConfigurationProperties("foo")

**public class** FooProperties {

**private** Map<String,Integer> contexts;

*// getters and setters*

}

The magic values are foo and bar for instance. In order to offer additional content assistance for the keys, you could add the following to [the manual meta-data of the module](#_bookmark588):

{***"hints"***: **[**

**{**

***"name"***: ***"foo.contexts.keys"*, *"values"***: **[**

**{**

***"value"***: ***"foo"***

**},**

**{**

***"value"***: ***"bar"***

**}**

**]**

**}**

]**}**

**Note**

Of course, you should have an Enum for those two values instead. This is by far the most effective approach to auto-completion if your IDE supports it.

### Value provider

Providers are a powerful way of attaching semantics to a property. We define in the section below the official providers that you can use for your own hints. Bare in mind however that your favorite IDE may implement some of these or none of them. It could eventually provide its own as well.

**Note**

As this is a new feature, IDE vendors will have to catch up with this new feature. The table below summarizes the list of supported providers:

|  |  |
| --- | --- |
| **Name**  any | **Description**  Permit any additional value to be provided. |
| class-reference  handle-as | Auto-complete the classes available in the project. Usually constrained by a base class that is specified via the target parameter.  Handle the property as if it was defined by the type defined via the mandatory target parameter. |
| logger-name | Auto-complete valid logger names. Typically, package and class names available in the current project can be auto-completed. |
| spring-bean-reference | Auto-complete the available bean names in the current project. Usually constrained by a base class that is specified via the target parameter. |
| spring-profile-name | Auto-complete the available Spring profile names in the project. |

**Tip**

No more than one provider can be active for a given property but you can specify several providers if they can all manage the property *in some ways*. Make sure to place the most powerful provider first as the IDE must use the first one in the JSON section it can handle. If no provider for a given property is supported, no special content assistance is provided either.

#### Any

The **any** provider permits any additional values to be provided. Regular value validation based on the property type should be applied if this is supported.

This provider will be typically used if you have a list of values and any extra values are still to be considered as valid.

The example below offers on and off as auto-completion values for system.state; any other value is also allowed:

{***"hints"***: **[**

**{**

***"name"***: ***"system.state"*, *"values"***: **[**

**{**

***"value"***: ***"on"***

**},**

**{**

***"value"***: ***"off"***

**}**

]**,**

***"providers"***: **[**

**{**

***"name"***: ***"any"***

**}**

**]**

**}**

]**}**

#### Class reference

The **class-reference** provider auto-completes classes available in the project. This provider supports these parameters:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Type** | **Default value Description** |
| target  concrete | String  (Class)  boolean | *none* The fully qualified name of the class that should be assignable to the chosen value. Typically used to filter out non candidate classes. Note that this information can be provided by the type itself by exposing a class with the appropriate upper bound.  true Specify if only concrete classes are to be considered as valid candidates. |

The meta-data snippet below corresponds to the standard server.jsp-servlet.class-name

property that defines the JspServlet class name to use:

{***"hints"***: **[**

**{**

***"name"***: ***"server.jsp-servlet.class-name"*, *"providers"***: **[**

**{**

***"name"***: ***"class-reference"*, *"parameters"***: **{**

***"target"***: ***"javax.servlet.http.HttpServlet"***

**}**

**}**

**]**

**}**

]**}**

#### Handle As

The **handle-as** provider allows you to substitute the type of the property to a more high-level type. This typically happens when the property has a java.lang.String type because you don’t want your configuration classes to rely on classes that may not be on the classpath. This provider supports these parameters:

|  |  |  |
| --- | --- | --- |
| **Parameter**  **target** | **Type**  String  (Class) | **Default value Description**  *none* The fully qualified name of the type to consider for the property. This parameter is mandatory. |

The following types can be used:

* Any java.lang.Enum that lists the possible values for the property (By all means, try to define the property with the Enum type instead as no further hint should be required for the IDE to auto-complete the values).
* java.nio.charset.Charset: auto-completion of charset/encoding values (e.g. UTF-8)
* java.util.Locale: auto-completion of locales (e.g. en\_US)
* org.springframework.util.MimeType: auto-completion of content type values (e.g. text/ plain)
* org.springframework.core.io.Resource: auto-completion of Spring’s Resource abstraction to refer to a file on the filesystem or on the classpath. (e.g. classpath:/foo.properties)

**Note**

If multiple values can be provided, use a Collection or *Array* type to teach the IDE about it.

The meta-data snippet below corresponds to the standard liquibase.change-log property that defines the path to the changelog to use. It is actually used internally as a org.springframework.core.io.Resource but cannot be exposed as such as we need to keep the original String value to pass it to the Liquibase API.

{***"hints"***: **[**

**{**

***"name"***: ***"liquibase.change-log"*, *"providers"***: **[**

**{**

***"name"***: ***"handle-as"*, *"parameters"***: **{**

***"target"***: ***"org.springframework.core.io.Resource"***

**}**

**}**

**]**

**}**

]**}**

#### Logger name

The **logger-name** provider auto-completes valid logger names. Typically, package and class names available in the current project can be auto-completed. Specific frameworks may have extra magic logger names that could be supported as well.

Since a logger name can be any arbitrary name, really, this provider should allow any value but could highlight valid packages and class names that are not available in the project’s classpath.

The meta-data snippet below corresponds to the standard logging.level property, keys are *logger names* and values correspond to the standard log levels or any custom level:

{***"hints"***: **[**

**{**

***"name"***: ***"logging.level.keys"*, *"values"***: **[**

**{**

***"value"***: ***"root"*,**

***"description"***: ***"Root logger used to assign the default logging level."***

**}**

]**,**

***"providers"***: **[**

**{**

***"name"***: ***"logger-name"***

**}**

**]**

**},**

**{**

***"name"***: ***"logging.level.values"*, *"values"***: **[**

**{**

***"value"***: ***"trace"***

**},**

**{**

***"value"***: ***"debug"***

**},**

**{**

***"value"***: ***"info"***

**},**

**{**

***"value"***: ***"warn"***

**},**

**{**

***"value"***: ***"error"***

**},**

**{**

***"value"***: ***"fatal"***

**},**

**{**

***"value"***: ***"off"***

**}**

]**,**

***"providers"***: **[**

**{**

***"name"***: ***"any"***

**}**

**]**

**}**

]**}**

#### Spring bean reference

The **spring-bean-reference** provider auto-completes the beans that are defined in the configuration of the current project. This provider supports these parameters:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Type** | **Default value Description** |
| target | String  (Class) | *none* The fully qualified name of the bean class that should be assignable to the candidate. Typically used to filter out non candidate beans. |

The meta-data snippet below corresponds to the standard spring.jmx.server property that defines the name of the MBeanServer bean to use:

{***"hints"***: **[**

**{**

***"name"***: ***"spring.jmx.server"*, *"providers"***: **[**

**{**

***"name"***: ***"spring-bean-reference"*, *"parameters"***: **{**

***"target"***: ***"javax.management.MBeanServer"***

**}**

**}**

**]**

**}**

]**}**

**Note**

The binder is not aware of the meta-data so if you provide that hint, you will still need to transform the bean name into an actual Bean reference using the ApplicationContext.

#### Spring profile name

The **spring-profile-name** provider auto-completes the Spring profiles that are defined in the configuration of the current project.

The meta-data snippet below corresponds to the standard spring.profiles.active property that defines the name of the Spring profile(s) to enable:

{***"hints"***: **[**

**{**

***"name"***: ***"spring.profiles.active"*, *"providers"***: **[**

**{**

***"name"***: ***"spring-profile-name"***

**}**

**]**

**}**

]**}**

## Generating your own meta-data using the annotation processor

You can easily generate your own configuration meta-data file from items annotated with @ConfigurationProperties by using the spring-boot-configuration-processor jar. The jar includes a Java annotation processor which is invoked as your project is compiled. To use the processor, simply include spring-boot-configuration-processor as an optional dependency, for example with Maven you would add:

**<dependency>**

**<groupId>**org.springframework.boot**</groupId>**

**<artifactId>**spring-boot-configuration-processor**</artifactId>**

**<optional>**true**</optional>**

**</dependency>**

With Gradle, you can use the [propdeps-plugin](https://github.com/spring-gradle-plugins/propdeps-plugin) and specify:

dependencies {

optional ***"org.springframework.boot:spring-boot-configuration-processor"***

}

compileJava.dependsOn(processResources)

**Note**

You need to add compileJava.dependsOn(processResources) to your build to ensure that resources are processed before code is compiled. Without this directive any additional- spring-configuration-metadata.json files will not be processed.

The processor will pick up both classes and methods that are annotated with @ConfigurationProperties. The Javadoc for field values within configuration classes will be used to populate the description attribute.

**Note**

You should only use simple text with @ConfigurationProperties field Javadoc since they are not processed before being added to the JSON.

Properties are discovered via the presence of standard getters and setters with special handling for collection types (that will be detected even if only a getter is present). The annotation processor also supports the use of the @Data, @Getter and @Setter lombok annotations.

**Note**

If you are using AspectJ in your project, you need to make sure that the annotation processor only runs once. There are several ways to do this: with Maven, you can configure the maven-apt- plugin explicitly and add the dependency to the annotation processor only there. You could also let the AspectJ plugin run all the processing and disable annotation processing in the maven- compiler-plugin configuration:

**<plugin>**

**<groupId>**org.apache.maven.plugins**</groupId>**

**<artifactId>**maven-compiler-plugin**</artifactId>**

**<configuration>**

**<proc>**none**</proc>**

**</configuration>**

**</plugin>**

### Nested properties

The annotation processor will automatically consider inner classes as nested properties. For example, the following class:

@ConfigurationProperties(prefix="server")

**public class** ServerProperties { **private** String name; **private** Host host;

*// ... getter and setters*

**private static class** Host { **private** String ip; **private int** port;

*// ... getter and setters*

}

}

Will produce meta-data information for server.name, server.host.ip and server.host.port properties. You can use the @NestedConfigurationProperty annotation on a field to indicate that a regular (non-inner) class should be treated as if it were nested.

**Tip**

This has no effect on collections and maps as those types are automatically identified and a single meta-data property is generated for each of them.

### Adding additional meta-data

Spring Boot’s configuration file handling is quite flexible; and it is often the case that properties may exist that are not bound to a @ConfigurationProperties bean. You may also need to tune

some attributes of an existing key. To support such cases and allow you to provide custom "hints", the annotation processor will automatically merge items from META-INF/additional-spring- configuration-metadata.json into the main meta-data file.

If you refer to a property that has been detected automatically, the description, default value and deprecation information are overridden if specified. If the manual property declaration is not identified in the current module, it is added as a brand new property.

The format of the additional-spring-configuration-metadata.json file is exactly the same as the regular spring-configuration-metadata.json. The additional properties file is optional, if you don’t have any additional properties, simply don’t add it.

**Appendix C. Auto-configuration classes**

Here is a list of all auto-configuration classes provided by Spring Boot with links to documentation and source code. Remember to also look at the autoconfig report in your application for more details of which features are switched on. (start the app with --debug or -Ddebug, or in an Actuator application use the autoconfig endpoint).

## From the “spring-boot-autoconfigure” module

The following auto-configuration classes are from the spring-boot-autoconfigure module:

|  |  |
| --- | --- |
| **Configuration Class** | **Links** |
| [ActiveMQAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jms/activemq/ActiveMQAutoConfiguration.java)  [AopAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/aop/AopAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/jms/activemq/ActiveMQAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/aop/AopAutoConfiguration.html) |
| [ArtemisAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jms/artemis/ArtemisAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/jms/artemis/ArtemisAutoConfiguration.html) |
| [BatchAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/batch/BatchAutoConfiguration.java)  [CacheAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/cache/CacheAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/batch/BatchAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/cache/CacheAutoConfiguration.html) |
| [CassandraAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/cassandra/CassandraAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/cassandra/CassandraAutoConfiguration.html) |
| [CassandraDataAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/data/cassandra/CassandraDataAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/data/cassandra/CassandraDataAutoConfiguration.html) |
| [CassandraRepositoriesAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/data/cassandra/CassandraRepositoriesAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/data/cassandra/CassandraRepositoriesAutoConfiguration.html) |
| [CloudAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/cloud/CloudAutoConfiguration.java)  [ConfigurationPropertiesAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/context/ConfigurationPropertiesAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/cloud/CloudAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/context/ConfigurationPropertiesAutoConfiguration.html) |
| [CouchbaseAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/couchbase/CouchbaseAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/couchbase/CouchbaseAutoConfiguration.html) |
| [CouchbaseDataAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/data/couchbase/CouchbaseDataAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/data/couchbase/CouchbaseDataAutoConfiguration.html) |
| [CouchbaseRepositoriesAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/data/couchbase/CouchbaseRepositoriesAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/data/couchbase/CouchbaseRepositoriesAutoConfiguration.html) |
| [DataSourceAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jdbc/DataSourceAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/jdbc/DataSourceAutoConfiguration.html) |
| [DataSourceTransactionManagerAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jdbc/DataSourceTransactionManagerAutoConfiguration.java)  [DeviceDelegatingViewResolverAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/mobile/DeviceDelegatingViewResolverAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/jdbc/DataSourceTransactionManagerAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/mobile/DeviceDelegatingViewResolverAutoConfiguration.html) |
| [DeviceResolverAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/mobile/DeviceResolverAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/mobile/DeviceResolverAutoConfiguration.html) |
| [DispatcherServletAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/DispatcherServletAutoConfiguration.java)  [ElasticsearchAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/data/elasticsearch/ElasticsearchAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/web/DispatcherServletAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/data/elasticsearch/ElasticsearchAutoConfiguration.html) |
| [ElasticsearchDataAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/data/elasticsearch/ElasticsearchDataAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/data/elasticsearch/ElasticsearchDataAutoConfiguration.html) |
| [ElasticsearchRepositoriesAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/data/elasticsearch/ElasticsearchRepositoriesAutoConfiguration.java)  [EmbeddedLdapAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/ldap/embedded/EmbeddedLdapAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/data/elasticsearch/ElasticsearchRepositoriesAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/ldap/embedded/EmbeddedLdapAutoConfiguration.html) |

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| [FallbackWebSecurityAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/security/FallbackWebSecurityAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/security/FallbackWebSecurityAutoConfiguration.html) |
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| [HazelcastJpaDependencyAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/hazelcast/HazelcastJpaDependencyAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/hazelcast/HazelcastJpaDependencyAutoConfiguration.html) |
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| [JmxAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jmx/JmxAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/jmx/JmxAutoConfiguration.html) |
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| [JooqAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jooq/JooqAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/jooq/JooqAutoConfiguration.html) |
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| [KafkaAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/kafka/KafkaAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/kafka/KafkaAutoConfiguration.html) |
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| --- | --- |
| **Configuration Class** | **Links** |
| [SolrAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/solr/SolrAutoConfiguration.java)  [SolrRepositoriesAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/data/solr/SolrRepositoriesAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/solr/SolrAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/data/solr/SolrRepositoriesAutoConfiguration.html) |
| [SpringApplicationAdminJmxAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/admin/SpringApplicationAdminJmxAutoConfiguration.java)  [SpringDataWebAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/data/web/SpringDataWebAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/admin/SpringApplicationAdminJmxAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/data/web/SpringDataWebAutoConfiguration.html) |
| [ThymeleafAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/thymeleaf/ThymeleafAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/thymeleaf/ThymeleafAutoConfiguration.html) |
| [TransactionAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/transaction/TransactionAutoConfiguration.java)  [TwitterAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/social/TwitterAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/transaction/TransactionAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/social/TwitterAutoConfiguration.html) |
| [ValidationAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/validation/ValidationAutoConfiguration.java)  [WebClientAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/WebClientAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/validation/ValidationAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/web/WebClientAutoConfiguration.html) |
| [WebMvcAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/web/WebMvcAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/web/WebMvcAutoConfiguration.html) |
| [WebServicesAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/webservices/WebServicesAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/webservices/WebServicesAutoConfiguration.html) |
| [WebSocketAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/websocket/WebSocketAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/websocket/WebSocketAutoConfiguration.html) |
| [WebSocketMessagingAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/websocket/WebSocketMessagingAutoConfiguration.java)  [XADataSourceAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-autoconfigure/src/main/java/org/springframework/boot/autoconfigure/jdbc/XADataSourceAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/websocket/WebSocketMessagingAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/autoconfigure/jdbc/XADataSourceAutoConfiguration.html) |

## From the “spring-boot-actuator” module

The following auto-configuration classes are from the spring-boot-actuator module:

|  |  |
| --- | --- |
| **Configuration Class**  [AuditAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/AuditAutoConfiguration.java) | **Links**  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/AuditAutoConfiguration.html) |
| [CacheStatisticsAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/CacheStatisticsAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/CacheStatisticsAutoConfiguration.html) |
| [CloudFoundryActuatorAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/cloudfoundry/CloudFoundryActuatorAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/cloudfoundry/CloudFoundryActuatorAutoConfiguration.html) |
| [CrshAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/CrshAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/CrshAutoConfiguration.html) |
| [EndpointAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/EndpointAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/EndpointAutoConfiguration.html) |
| [EndpointMBeanExportAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/EndpointMBeanExportAutoConfiguration.java)  [EndpointWebMvcAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/EndpointWebMvcAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/EndpointMBeanExportAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/EndpointWebMvcAutoConfiguration.html) |
| [HealthIndicatorAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/HealthIndicatorAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/HealthIndicatorAutoConfiguration.html) |
| [InfoContributorAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/InfoContributorAutoConfiguration.java)  [JolokiaAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/JolokiaAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/InfoContributorAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/JolokiaAutoConfiguration.html) |
| [ManagementServerPropertiesAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/ManagementServerPropertiesAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/ManagementServerPropertiesAutoConfiguration.html) |
| [ManagementWebSecurityAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/ManagementWebSecurityAutoConfiguration.java)  [MetricExportAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/MetricExportAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/ManagementWebSecurityAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/MetricExportAutoConfiguration.html) |

|  |  |
| --- | --- |
| **Configuration Class** | **Links** |
| [MetricFilterAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/MetricFilterAutoConfiguration.java)  [MetricRepositoryAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/MetricRepositoryAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/MetricFilterAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/MetricRepositoryAutoConfiguration.html) |
| [MetricsChannelAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/MetricsChannelAutoConfiguration.java)  [MetricsDropwizardAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/MetricsDropwizardAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/MetricsChannelAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/MetricsDropwizardAutoConfiguration.html) |
| [PublicMetricsAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/PublicMetricsAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/PublicMetricsAutoConfiguration.html) |
| [TraceRepositoryAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/TraceRepositoryAutoConfiguration.java)  [TraceWebFilterAutoConfiguration](https://github.com/spring-projects/spring-boot/tree/v1.5.8.RELEASE/spring-boot-actuator/src/main/java/org/springframework/boot/actuate/autoconfigure/TraceWebFilterAutoConfiguration.java) | [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/TraceRepositoryAutoConfiguration.html)  [javadoc](http://docs.spring.io/spring-boot/docs/1.5.8.RELEASE/api/org/springframework/boot/actuate/autoconfigure/TraceWebFilterAutoConfiguration.html) |

**Appendix D. Test auto-configuration annotations**

Here is a table of the various @…Test annotations that can be used to test slices of your application and the auto-configuration that they import by default:

|  |  |
| --- | --- |
| **Test slice** | **Imported auto-configuration** |
| @DataJpaTest | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.test.autocon |
|  | org.springframework.boot.test.autocon |
| @DataMongoTest | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
| @JdbcTest | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.test.autocon |
| @JsonTest | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.test.autocon |
| @RestClientTest | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.autoconfigur |
|  | org.springframework.boot.test.autocon |
|  | org.springframework.boot.test.autocon |
| @WebMvcTest org.springframework.boot.autoconfigur org.springframework.boot.autoconfigur | |

e.cache.Cach e.data.jpa.J e.flyway.Fly e.jdbc.DataS e.jdbc.DataS e.jdbc.JdbcT e.liquibase. e.orm.jpa.Hi e.transactio figure.jdbc. figure.orm.j

e.cache.Cach e.data.mongo e.data.mongo e.mongo.Mong e.mongo.embe

e.cache.Cach e.flyway.Fly e.jdbc.DataS e.jdbc.DataS e.jdbc.JdbcT e.liquibase. e.transactio figure.jdbc.

e.cache.Cach e.gson.GsonA e.jackson.Ja figure.json.

e.cache.Cach e.gson.GsonA e.jackson.Ja e.web.HttpMe e.web.WebCli figure.web.c figure.web.c

e.cache.Cach e.context.Me

e.freemarker e.groovy.tem e.gson.GsonA e.hateoas.Hy e.jackson.Ja e.mustache.M e.thymeleaf. e.validation e.web.ErrorM e.web.HttpMe e.web.Server e.web.WebMvc figure.web.s figure.web.s figure.web.s figure.web.s

|  |
| --- |
| **Test slice Imported auto-configuration** |
| org.springframework.boot.autoconfigur org.springframework.boot.autoconfigur org.springframework.boot.autoconfigur org.springframework.boot.autoconfigur org.springframework.boot.autoconfigur org.springframework.boot.autoconfigur org.springframework.boot.autoconfigur org.springframework.boot.autoconfigur org.springframework.boot.autoconfigur org.springframework.boot.autoconfigur org.springframework.boot.autoconfigur org.springframework.boot.autoconfigur org.springframework.boot.test.autocon org.springframework.boot.test.autocon org.springframework.boot.test.autocon org.springframework.boot.test.autocon |

**Appendix E. The executable jar format**

The spring-boot-loader modules allows Spring Boot to support executable jar and war files. If you’re using the Maven or Gradle plugin, executable jars are automatically generated and you generally won’t need to know the details of how they work.

If you need to create executable jars from a different build system, or if you are just curious about the underlying technology, this section provides some background.

## Nested JARs

Java does not provide any standard way to load nested jar files (i.e. jar files that are themselves contained within a jar). This can be problematic if you are looking to distribute a self-contained application that you can just run from the command line without unpacking.

To solve this problem, many developers use “shaded” jars. A shaded jar simply packages all classes, from all jars, into a single 'uber jar'. The problem with shaded jars is that it becomes hard to see which libraries you are actually using in your application. It can also be problematic if the same filename is used (but with different content) in multiple jars. Spring Boot takes a different approach and allows you to actually nest jars directly.

### The executable jar file structure

Spring Boot Loader compatible jar files should be structured in the following way:

example.jar

|

+-META-INF

| +-MANIFEST.MF

+-org

| +-springframework

| +-boot

| +-loader

| +-<spring boot loader classes>

+-BOOT-INF

+-classes

| +-mycompany

| +-project

| +-YourClasses.class

+-lib

+-dependency1.jar

+-dependency2.jar

Application classes should be placed in a nested BOOT-INF/classes directory. Dependencies should be placed in a nested BOOT-INF/lib directory.

### The executable war file structure

Spring Boot Loader compatible war files should be structured in the following way:

example.war

|

+-META-INF

| +-MANIFEST.MF

+-org

| +-springframework

| +-boot

| +-loader

| +-<spring boot loader classes>

+-WEB-INF

+-classes

| +-com

| +-mycompany

| +-project

| +-YourClasses.class

+-lib

| +-dependency1.jar

| +-dependency2.jar

+-lib-provided

+-servlet-api.jar

+-dependency3.jar

Dependencies should be placed in a nested WEB-INF/lib directory. Any dependencies that are required when running embedded but are not required when deploying to a traditional web container should be placed in WEB-INF/lib-provided.

## Spring Boot’s “JarFile” class

The core class used to support loading nested jars is org.springframework.boot.loader.jar.JarFile. It allows you to load jar content from a standard jar file, or from nested child jar data. When first loaded, the location of each JarEntry is mapped to a physical file offset of the outer jar:

myapp.jar

+-------------------+-------------------------+

| /BOOT-INF/classes | /BOOT-INF/lib/mylib.jar |

|+-----------------+||+-----------+----------+|

|| A.class ||| B.class | C.class ||

|+-----------------+||+-----------+----------+|

+-------------------+-------------------------+

^ ^ ^

0063 3452 3980

The example above shows how A.class can be found in /BOOT-INF/classes in myapp.jar position 0063. B.class from the nested jar can actually be found in myapp.jar position 3452 and C.class is at position 3980.

Armed with this information, we can load specific nested entries by simply seeking to the appropriate part of the outer jar. We don’t need to unpack the archive and we don’t need to read all entry data into memory.

### Compatibility with the standard Java “JarFile”

Spring Boot Loader strives to remain compatible with existing code and libraries. org.springframework.boot.loader.jar.JarFile extends from java.util.jar.JarFile and should work as a drop-in replacement. The getURL() method will return a URL that opens a java.net.JarURLConnection compatible connection and can be used with Java’s URLClassLoader.

## Launching executable jars

The org.springframework.boot.loader.Launcher class is a special bootstrap class that is used as an executable jars main entry point. It is the actual Main-Class in your jar file and it’s used to setup an appropriate URLClassLoader and ultimately call your main() method.

There are 3 launcher subclasses (JarLauncher, WarLauncher and PropertiesLauncher). Their purpose is to load resources (.class files etc.) from nested jar files or war files in directories (as opposed to explicitly on the classpath). In the case of JarLauncher and WarLauncher the nested paths are fixed. JarLauncher looks in BOOT-INF/lib/ and WarLauncher looks in WEB-INF/ lib/ and WEB-INF/lib-provided/ so you just add extra jars in those locations if you want more. The PropertiesLauncher looks in BOOT-INF/lib/ in your application archive by default, but you can add additional locations by setting an environment variable LOADER\_PATH or loader.path in loader.properties (comma-separated list of directories, archives, or directories within archives).

### Launcher manifest

You need to specify an appropriate Launcher as the Main-Class attribute of META-INF/ MANIFEST.MF. The actual class that you want to launch (i.e. the class that you wrote that contains a main method) should be specified in the Start-Class attribute.

For example, here is a typical MANIFEST.MF for an executable jar file:

Main-Class: org.springframework.boot.loader.JarLauncher Start-Class: com.mycompany.project.MyApplication

For a war file, it would be:

Main-Class: org.springframework.boot.loader.WarLauncher Start-Class: com.mycompany.project.MyApplication

**Note**

You do not need to specify Class-Path entries in your manifest file, the classpath will be deduced from the nested jars.

### Exploded archives

Certain PaaS implementations may choose to unpack archives before they run. For example, Cloud Foundry operates in this way. You can run an unpacked archive by simply starting the appropriate launcher:

$ unzip -q myapp.jar

$ java org.springframework.boot.loader.JarLauncher

## PropertiesLauncher Features

PropertiesLauncher has a few special features that can be enabled with external properties (System properties, environment variables, manifest entries or loader.properties).

**Note**

PropertiesLauncher supports loading properties from loader.properties and also (for historic reasons) application.properties. We recommend using loader.properties exclusively, as support for application.properties is deprecated and may be removed in the future.

|  |  |
| --- | --- |
| **Key** | **Purpose** |
| loader.path  loader.home | Comma-separated Classpath, e.g. lib,  ${HOME}/app/lib. Earlier entries take precedence, just like a regular -classpath on the javac command line.  Used to resolve relative paths in  loader.path. E.g. loader.path=lib then  ${loader.home}/lib is a classpath location (along with all jar files in that directory). Also used to locate a loader.properties file.  Example /opt/app (defaults to ${user.dir}). |
| loader.args | Default arguments for the main method (space |
|  | separated) |
| loader.main | Name of main class to launch, e.g. |
|  | com.app.Application. |
| loader.config.name | Name of properties file, e.g. launcher (defaults to loader). |
| loader.config.location | Path to properties file, e.g. classpath:loader.properties (defaults to loader.properties). |
| loader.system | Boolean flag to indicate that all properties should be added to System properties (defaults to false) |

When specified as environment variables or manifest entries, the following names should be used:

|  |  |  |
| --- | --- | --- |
| **Key** | **Manifest entry** | **Environment variable** |
| loader.path  loader.home | Loader-Path  Loader-Home | LOADER\_PATH  LOADER\_HOME |
| loader.args | Loader-Args | LOADER\_ARGS |
| loader.main  loader.config.location | Start-Class  Loader-Config-Location | LOADER\_MAIN  LOADER\_CONFIG\_LOCATION |
| loader.system | Loader-System | LOADER\_SYSTEM |

**Tip**

Build plugins automatically move the Main-Class attribute to Start-Class when the fat jar is built. If you are using that, specify the name of the class to launch using the Main-Class attribute and leave out Start-Class.

* loader.properties are searched for in loader.home then in the root of the classpath, then in

classpath:/BOOT-INF/classes. The first location that exists is used.

* loader.home is only the directory location of an additional properties file (overriding the default) as long as loader.config.location is not specified.
* loader.path can contain directories (scanned recursively for jar and zip files), archive paths, a directory within an archive that is scanned for jar files (for example, dependencies.jar!/lib), or wildcard patterns (for the default JVM behavior). Archive paths can be relative to loader.home, or anywhere in the file system with a jar:file: prefix.
* loader.path (if empty) defaults to BOOT-INF/lib (meaning a local directory or a nested one if running from an archive). Because of this PropertiesLauncher behaves the same as JarLauncher when no additional configuration is provided.
* loader.path can not be used to configure the location of loader.properties (the classpath used to search for the latter is the JVM classpath when PropertiesLauncher is launched).
* Placeholder replacement is done from System and environment variables plus the properties file itself on all values before use.
* The search order for properties (where it makes sense to look in more than one place) is env vars, system properties, loader.properties, exploded archive manifest, archive manifest.

## Executable jar restrictions

There are a number of restrictions that you need to consider when working with a Spring Boot Loader packaged application.

### Zip entry compression

The ZipEntry for a nested jar must be saved using the ZipEntry.STORED method. This is required so that we can seek directly to individual content within the nested jar. The content of the nested jar file itself can still be compressed, as can any other entries in the outer jar.

### System ClassLoader

Launched applications should use Thread.getContextClassLoader() when loading classes (most libraries and frameworks will do this by default). Trying to load nested jar classes via ClassLoader.getSystemClassLoader() will fail. Please be aware that java.util.Logging always uses the system classloader, for this reason you should consider a different logging implementation.

## Alternative single jar solutions

If the above restrictions mean that you cannot use Spring Boot Loader the following alternatives could be considered:

* [Maven Shade Plugin](http://maven.apache.org/plugins/maven-shade-plugin/)
* [JarClassLoader](http://www.jdotsoft.com/JarClassLoader.php)
* [OneJar](http://one-jar.sourceforge.net/)

**Appendix F. Dependency versions**

The table below provides details of all of the dependency versions that are provided by Spring Boot in its CLI, Maven dependency management and Gradle plugin. When you declare a dependency on one of these artifacts without declaring a version the version that is listed in the table will be used.

|  |  |  |
| --- | --- | --- |
| **Group ID** | **Artifact ID** | **Version** |
| antlr | antlr | 2.7.7 |
| ch.qos.logback | logback-access | 1.1.11 |
| ch.qos.logback | logback-classic | 1.1.11 |
| ch.qos.logback | logback-core | 1.1.11 |
| com.atomikos | transactions-jdbc | 3.9.3 |
| com.atomikos | transactions-jms | 3.9.3 |
| com.atomikos | transactions-jta | 3.9.3 |
| com.couchbase.client | couchbase-spring-cache | 2.1.0 |
| com.couchbase.client | java-client | 2.3.7 |
| com.datastax.cassandra | cassandra-driver-core | 3.1.4 |
| com.datastax.cassandra | cassandra-driver- mapping | 3.1.4 |
| com.fasterxml | classmate | 1.3.4 |

com.fasterxml.jackson.corejackson-annotations 2.8.0

com.fasterxml.jackson.corejackson-core 2.8.10

com.fasterxml.jackson.corejackson-databind 2.8.10

com.fasterxml.jackson.datajfaocrkmsaotn-dataformat-avro 2.8.10

com.fasterxml.jackson.datajfaocrkmsaotn-dataformat-cbor 2.8.10

com.fasterxml.jackson.datajfaocrkmsaotn-dataformat-csv 2.8.10

com.fasterxml.jackson.datajfaocrkmsaotn-dataformat-ion 2.8.10

com.fasterxml.jackson.datajfaocrkmsaotn-dataformat-

properties

com.fasterxml.jackson.datajfaocrkmsaotn-dataformat-

protobuf

com.fasterxml.jackson.datajfaocrkmsaotn-dataformat-

smile

2.8.10

2.8.10

2.8.10

com.fasterxml.jackson.datajfaocrkmsaotn-dataformat-xml 2.8.10

com.fasterxml.jackson.datajfaocrkmsaotn-dataformat-yaml 2.8.10

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com.fasterxml.jackson.datajtaycpkeson-datatype-guava 2.8.10

com.fasterxml.jackson.datajtaycpkeson-datatype-

hibernate3

com.fasterxml.jackson.datajtaycpkeson-datatype-

hibernate4

com.fasterxml.jackson.datajtaycpkeson-datatype-

hibernate5

2.8.10

2.8.10

2.8.10

com.fasterxml.jackson.datajtaycpkeson-datatype-hppc 2.8.10

com.fasterxml.jackson.datajtaycpkeson-datatype-jaxrs 2.8.10

com.fasterxml.jackson.datajtaycpkeson-datatype-jdk8 2.8.10

com.fasterxml.jackson.datajtaycpkeson-datatype-joda 2.8.10

com.fasterxml.jackson.datajtaycpkeson-datatype-json-

org

2.8.10

com.fasterxml.jackson.datajtaycpkeson-datatype-jsr310 2.8.10

com.fasterxml.jackson.datajtaycpkeson-datatype-jsr353 2.8.10

com.fasterxml.jackson.datajtaycpkeson-datatype-

pcollections

2.8.10

com.fasterxml.jackson.jaxrjsackson-jaxrs-base 2.8.10

com.fasterxml.jackson.jaxrjsackson-jaxrs-cbor-

provider

com.fasterxml.jackson.jaxrjsackson-jaxrs-json-

provider

com.fasterxml.jackson.jaxrjsackson-jaxrs-smile-

provider

com.fasterxml.jackson.jaxrjsackson-jaxrs-xml-

provider

com.fasterxml.jackson.jaxrjsackson-jaxrs-yaml-

provider

2.8.10

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2.8.10

com.fasterxml.jackson.jr jackson-jr-all 2.8.10

com.fasterxml.jackson.jr jackson-jr-objects 2.8.10

com.fasterxml.jackson.jr jackson-jr-retrofit2 2.8.10

com.fasterxml.jackson.jr jackson-jr-stree 2.8.10

com.fasterxml.jackson.modujlaeckson-module-

afterburner

2.8.10

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com.fasterxml.jackson.modujlaeckson-module-guice 2.8.10

com.fasterxml.jackson.modujlaeckson-module-jaxb-

annotations

com.fasterxml.jackson.modujlaeckson-module-

jsonSchema

2.8.10

2.8.10

com.fasterxml.jackson.modujlaeckson-module-kotlin 2.8.10

com.fasterxml.jackson.modujlaeckson-module-mrbean 2.8.10

com.fasterxml.jackson.modujlaeckson-module-osgi 2.8.10

com.fasterxml.jackson.modujlaeckson-module-

parameter-names

com.fasterxml.jackson.modujlaeckson-module-

paranamer

com.fasterxml.jackson.modujlaeckson-module-

scala\_2.10

com.fasterxml.jackson.modujlaeckson-module-

scala\_2.11

com.fasterxml.jackson.modujlaeckson-module-

scala\_2.12

2.8.10

2.8.10

2.8.10

2.8.10

2.8.10

com.gemstone.gemfire gemfire 8.2.7

com.github.ben- manes.caffeine

caffeine 2.3.5

com.github.mxab.thymeleaf.tehxytmrealseaf-extras-data-

attribute

1.3

com.google.appengine appengine-api-1.0-sdk 1.9.58

com.google.code.gson gson 2.8.2

com.googlecode.json- simple

json-simple 1.1.1

com.h2database h2 1.4.196

com.hazelcast hazelcast 3.7.8

com.hazelcast hazelcast-client 3.7.8

com.hazelcast hazelcast-hibernate4 3.7.1

com.hazelcast hazelcast-hibernate5 1.1.3

com.hazelcast hazelcast-spring 3.7.8

com.jayway.jsonpath json-path 2.2.0

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| **Group ID** | **Artifact ID** | **Version** |
| com.jayway.jsonpath  com.microsoft.sqlserver | json-path-assert  mssql-jdbc | 2.2.0  6.1.0.jre7 |
| com.querydsl  com.querydsl | querydsl-apt  querydsl-collections | 4.1.4  4.1.4 |
| com.querydsl | querydsl-core | 4.1.4 |
| com.querydsl  com.querydsl | querydsl-jpa  querydsl-mongodb | 4.1.4  4.1.4 |
| com.samskivert  com.sendgrid | jmustache  sendgrid-java | 1.13  2.2.2 |
| com.sun.mail | javax.mail | 1.5.6 |
| com.timgroup | java-statsd-client | 3.1.0 |
| com.unboundid | unboundid-ldapsdk | 3.2.1 |
| com.zaxxer  com.zaxxer | HikariCP  HikariCP-java6 | 2.5.1  2.3.13 |
| com.zaxxer | HikariCP-java7 | 2.4.13 |
| commons-beanutils | commons-beanutils | 1.9.3 |
| commons-codec | commons-codec | 1.10 |
| commons-collections  commons-dbcp | commons-collections  commons-dbcp | 3.2.2  1.4 |
| commons-digester | commons-digester | 2.1 |
| commons-pool | commons-pool | 1.6 |
| de.flapdoodle.embed | de.flapdoodle.embed.mongo1.50.5 | |
| dom4j | dom4j | 1.6.1 |
| io.dropwizard.metrics  io.dropwizard.metrics | metrics-annotation  metrics-core | 3.1.5  3.1.5 |
| io.dropwizard.metrics | metrics-ehcache | 3.1.5 |
| io.dropwizard.metrics  io.dropwizard.metrics | metrics-ganglia  metrics-graphite | 3.1.5  3.1.5 |
| io.dropwizard.metrics | metrics-healthchecks | 3.1.5 |
| io.dropwizard.metrics | metrics-httpasyncclient | 3.1.5 |

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| **Group ID** | **Artifact ID** | **Version** |
| io.dropwizard.metrics  io.dropwizard.metrics | metrics-jdbi  metrics-jersey | 3.1.5  3.1.5 |
| io.dropwizard.metrics  io.dropwizard.metrics | metrics-jersey2  metrics-jetty8 | 3.1.5  3.1.5 |
| io.dropwizard.metrics | metrics-jetty9 | 3.1.5 |
| io.dropwizard.metrics  io.dropwizard.metrics | metrics-jetty9-legacy  metrics-json | 3.1.5  3.1.5 |
| io.dropwizard.metrics  io.dropwizard.metrics | metrics-jvm  metrics-log4j | 3.1.5  3.1.5 |
| io.dropwizard.metrics | metrics-log4j2 | 3.1.5 |
| io.dropwizard.metrics | metrics-logback | 3.1.5 |
| io.dropwizard.metrics | metrics-servlet | 3.1.5 |
| io.dropwizard.metrics  io.projectreactor | metrics-servlets  reactor-bus | 3.1.5  2.0.8.RELEASE |
| io.projectreactor | reactor-core | 2.0.8.RELEASE |
| io.projectreactor | reactor-groovy | 2.0.8.RELEASE |
| io.projectreactor | reactor-groovy- extensions | 2.0.8.RELEASE |
| io.projectreactor  io.projectreactor | reactor-logback  reactor-net | 2.0.8.RELEASE  2.0.8.RELEASE |
| io.projectreactor | reactor-stream | 2.0.8.RELEASE |
| io.projectreactor.spring | reactor-spring-context | 2.0.7.RELEASE |
| io.projectreactor.spring io.projectreactor.spring | reactor-spring-core  reactor-spring- messaging | 2.0.7.RELEASE  2.0.7.RELEASE |
| io.projectreactor.spring  io.searchbox | reactor-spring-webmvc  jest | 2.0.7.RELEASE  2.0.4 |
| io.undertow | undertow-core | 1.4.20.Final |
| io.undertow  io.undertow | undertow-servlet  undertow-websockets-jsr | 1.4.20.Final  1.4.20.Final |
| javax.cache | cache-api | 1.0.0 |

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| **Group ID** | **Artifact ID** | **Version** |
| javax.jms  javax.mail | jms-api  javax.mail-api | 1.1-rev-1  1.5.6 |
| javax.servlet  javax.servlet | javax.servlet-api  jstl | 3.1.0  1.2 |
| javax.transaction | javax.transaction-api | 1.2 |
| javax.validation  jaxen | validation-api  jaxen | 1.1.0.Final  1.1.6 |
| joda-time  junit | joda-time  junit | 2.9.9  4.12 |
| mysql | mysql-connector-java | 5.1.44 |
| net.java.dev.jna | jna | 4.2.2 |
| net.java.dev.jna | jna-platform | 4.2.2 |
| net.sf.ehcache  net.sourceforge.htmlunit | ehcache  htmlunit | 2.10.4  2.21 |
| net.sourceforge.jtds | jtds | 1.3.1 |
| net.sourceforge.nekohtml | nekohtml | 1.9.22 |
| nz.net.ultraq.thymeleaf | thymeleaf-layout- dialect | 1.4.0 |
| org.apache.activemq  org.apache.activemq | activemq-amqp  activemq-blueprint | 5.14.5  5.14.5 |
| org.apache.activemq | activemq-broker | 5.14.5 |
| org.apache.activemq | activemq-camel | 5.14.5 |
| org.apache.activemq  org.apache.activemq | activemq-client  activemq-console | 5.14.5  5.14.5 |
| org.apache.activemq  org.apache.activemq | activemq-http  activemq-jaas | 5.14.5  5.14.5 |
| org.apache.activemq | activemq-jdbc-store | 5.14.5 |
| org.apache.activemq  org.apache.activemq | activemq-jms-pool  activemq-kahadb-store | 5.14.5  5.14.5 |
| org.apache.activemq | activemq-karaf | 5.14.5 |
| org.apache.activemq | activemq-leveldb-store | 5.14.5 |

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| **Group ID** | **Artifact ID** | **Version** |
| org.apache.activemq | activemq-log4j-appender | 5.14.5 |
| org.apache.activemq | activemq-mqtt | 5.14.5 |
| org.apache.activemq | activemq-openwire- | 5.14.5 |
|  | generator |  |
| org.apache.activemq | activemq-openwire- | 5.14.5 |
|  | legacy |  |
| org.apache.activemq | activemq-osgi | 5.14.5 |
| org.apache.activemq | activemq-partition | 5.14.5 |
| org.apache.activemq | activemq-pool | 5.14.5 |
| org.apache.activemq | activemq-ra | 5.14.5 |
| org.apache.activemq | activemq-run | 5.14.5 |
| org.apache.activemq | activemq-runtime-config | 5.14.5 |
| org.apache.activemq | activemq-shiro | 5.14.5 |
| org.apache.activemq | activemq-spring | 5.14.5 |
| org.apache.activemq | activemq-stomp | 5.14.5 |
| org.apache.activemq | activemq-web | 5.14.5 |
| org.apache.activemq | artemis-amqp-protocol | 1.5.5 |
| org.apache.activemq | artemis-commons | 1.5.5 |
| org.apache.activemq | artemis-core-client | 1.5.5 |
| org.apache.activemq | artemis-jms-client | 1.5.5 |
| org.apache.activemq | artemis-jms-server | 1.5.5 |
| org.apache.activemq | artemis-journal | 1.5.5 |
| org.apache.activemq | artemis-native | 1.5.5 |
| org.apache.activemq | artemis-selector | 1.5.5 |
| org.apache.activemq | artemis-server | 1.5.5 |
| org.apache.activemq | artemis-service- | 1.5.5 |
|  | extensions |  |
| org.apache.commons | commons-dbcp2 | 2.1.1 |
| org.apache.commons | commons-pool2 | 2.4.2 |
| org.apache.derby  org.apache.httpcomponent | derby 10.13.1.1  shttpasyncclient 4.1.3 | |

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| **Group ID** | **Artifact ID** | **Version** |
| org.apache.httpcomponent  org.apache.httpcomponent | shttpclient 4.5.3  shttpcore 4.4.8 | |
| org.apache.httpcomponent | shttpmime  log4j-1.2-api | 4.5.3 |
| org.apache.logging.log4j | 2.7 |
| org.apache.logging.log4j | log4j-api | 2.7 |
| org.apache.logging.log4j | log4j-api-scala\_2.10 | 2.7 |
| org.apache.logging.log4j | log4j-api-scala\_2.11 | 2.7 |
| org.apache.logging.log4j | log4j-core | 2.7 |
| org.apache.logging.log4j | log4j-flume-ng | 2.7 |
| org.apache.logging.log4j | log4j-iostreams | 2.7 |
| org.apache.logging.log4j | log4j-jcl | 2.7 |
| org.apache.logging.log4j | log4j-jmx-gui | 2.7 |
| org.apache.logging.log4j | log4j-jul | 2.7 |
| org.apache.logging.log4j | log4j-liquibase | 2.7 |
| org.apache.logging.log4j | log4j-nosql | 2.7 |
| org.apache.logging.log4j | log4j-slf4j-impl | 2.7 |
| org.apache.logging.log4j | log4j-taglib | 2.7 |
| org.apache.logging.log4j | log4j-web | 2.7 |
| org.apache.solr | solr-analysis-extras | 5.5.4 |
| org.apache.solr | solr-analytics | 5.5.4 |
| org.apache.solr | solr-cell | 5.5.4 |
| org.apache.solr | solr-clustering | 5.5.4 |
| org.apache.solr | solr-core | 5.5.4 |
| org.apache.solr | solr-dataimporthandler | 5.5.4 |
| org.apache.solr | solr-dataimporthandler- | 5.5.4 |
|  | extras |  |
| org.apache.solr | solr-langid | 5.5.4 |
| org.apache.solr | solr-map-reduce | 5.5.4 |
| org.apache.solr | solr-morphlines-cell | 5.5.4 |
| org.apache.solr | solr-morphlines-core | 5.5.4 |
| org.apache.solr | solr-solrj | 5.5.4 |

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| **Group ID** | **Artifact ID** | **Version** |
| org.apache.solr | solr-test-framework | 5.5.4 |
| org.apache.solr | solr-uima | 5.5.4 |
| org.apache.solr | solr-velocity | 5.5.4 |
| org.apache.tomcat | tomcat-annotations-api | 8.5.23 |
| org.apache.tomcat | tomcat-jdbc | 8.5.23 |
| org.apache.tomcat | tomcat-jsp-api | 8.5.23 |
| org.apache.tomcat.embed | tomcat-embed-core | 8.5.23 |
| org.apache.tomcat.embed | tomcat-embed-el | 8.5.23 |
| org.apache.tomcat.embed | tomcat-embed-jasper | 8.5.23 |
| org.apache.tomcat.embed | tomcat-embed-websocket | 8.5.23 |
| org.aspectj | aspectjrt | 1.8.11 |
| org.aspectj | aspectjtools | 1.8.11 |
| org.aspectj | aspectjweaver | 1.8.11 |
| org.assertj | assertj-core | 2.6.0 |
| org.codehaus.btm | btm | 2.1.4 |
| org.codehaus.groovy | groovy | 2.4.12 |
| org.codehaus.groovy | groovy-all | 2.4.12 |
| org.codehaus.groovy | groovy-ant | 2.4.12 |
| org.codehaus.groovy | groovy-bsf | 2.4.12 |
| org.codehaus.groovy | groovy-console | 2.4.12 |
| org.codehaus.groovy | groovy-docgenerator | 2.4.12 |
| org.codehaus.groovy | groovy-groovydoc | 2.4.12 |
| org.codehaus.groovy | groovy-groovysh | 2.4.12 |
| org.codehaus.groovy | groovy-jmx | 2.4.12 |
| org.codehaus.groovy | groovy-json | 2.4.12 |
| org.codehaus.groovy | groovy-jsr223 | 2.4.12 |
| org.codehaus.groovy | groovy-nio | 2.4.12 |
| org.codehaus.groovy | groovy-servlet | 2.4.12 |
| org.codehaus.groovy | groovy-sql | 2.4.12 |
| org.codehaus.groovy | groovy-swing | 2.4.12 |

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| **Group ID** | **Artifact ID** | **Version** |
| org.codehaus.groovy | groovy-templates | 2.4.12 |
| org.codehaus.groovy | groovy-test | 2.4.12 |
| org.codehaus.groovy | groovy-testng | 2.4.12 |
| org.codehaus.groovy | groovy-xml | 2.4.12 |
| org.codehaus.janino | janino | 2.7.8 |
| org.crashub | crash.cli | 1.3.2 |
| org.crashub | crash.connectors.ssh | 1.3.2 |
| org.crashub | crash.connectors.telnet | 1.3.2 |
| org.crashub | crash.embed.spring | 1.3.2 |
| org.crashub | crash.plugins.cron | 1.3.2 |
| org.crashub | crash.plugins.mail | 1.3.2 |
| org.crashub | crash.shell | 1.3.2 |
| org.eclipse.jetty | apache-jsp | 9.4.7.v20170914 |
| org.eclipse.jetty | apache-jstl | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-alpn-client | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-alpn-java-client | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-alpn-java-server | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-alpn-server | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-annotations | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-ant | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-client | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-continuation | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-deploy | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-hazelcast | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-http | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-http-spi | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-infinispan | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-io | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-jaas | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-jaspi | 9.4.7.v20170914 |

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| **Group ID** | **Artifact ID** | **Version** |
| org.eclipse.jetty | jetty-jmx | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-jndi | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-nosql | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-plus | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-proxy | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-quickstart | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-rewrite | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-runner | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-security | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-server | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-servlet | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-servlets | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-spring | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-start | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-unixsocket | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-util | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-util-ajax | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-webapp | 9.4.7.v20170914 |
| org.eclipse.jetty | jetty-xml | 9.4.7.v20170914 |
| org.eclipse.jetty.cdi | cdi-core | 9.4.7.v20170914 |
| org.eclipse.jetty.cdi | cdi-servlet | 9.4.7.v20170914 |
| org.eclipse.jetty.fcgi | fcgi-client | 9.4.7.v20170914 |
| org.eclipse.jetty.fcgi | fcgi-server | 9.4.7.v20170914 |
| org.eclipse.jetty.gcloud | jetty-gcloud-session- | 9.4.7.v20170914 |
|  | manager |  |
| org.eclipse.jetty.http2 | http2-client | 9.4.7.v20170914 |
| org.eclipse.jetty.http2 | http2-common | 9.4.7.v20170914 |
| org.eclipse.jetty.http2 | http2-hpack | 9.4.7.v20170914 |
| org.eclipse.jetty.http2 | http2-http-client- | 9.4.7.v20170914 |
|  | transport |  |
| org.eclipse.jetty.http2 | http2-server | 9.4.7.v20170914 |

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org.eclipse.jetty.memcachejdetty-memcached-

sessions

9.4.7.v20170914

org.eclipse.jetty.orbit javax.servlet.jsp 2.2.0.v201112011158 org.eclipse.jetty.osgi jetty-httpservice 9.4.7.v20170914 org.eclipse.jetty.osgi jetty-osgi-boot 9.4.7.v20170914 org.eclipse.jetty.osgi jetty-osgi-boot-jsp 9.4.7.v20170914 org.eclipse.jetty.osgi jetty-osgi-boot-warurl 9.4.7.v20170914

org.eclipse.jetty.websockejtavax-websocket-client-

impl

org.eclipse.jetty.websockejtavax-websocket-server-

impl

9.4.7.v20170914

9.4.7.v20170914

org.eclipse.jetty.websockewtebsocket-api 9.4.7.v20170914 org.eclipse.jetty.websockewtebsocket-client 9.4.7.v20170914 org.eclipse.jetty.websockewtebsocket-common 9.4.7.v20170914 org.eclipse.jetty.websockewtebsocket-server 9.4.7.v20170914 org.eclipse.jetty.websockewtebsocket-servlet 9.4.7.v20170914 org.ehcache ehcache 3.2.3

org.ehcache ehcache-clustered 3.2.3

org.ehcache ehcache-transactions 3.2.3

org.elasticsearch elasticsearch 2.4.6

org.firebirdsql.jdbc jaybird-jdk16 2.2.13

org.firebirdsql.jdbc jaybird-jdk17 2.2.13

org.firebirdsql.jdbc jaybird-jdk18 2.2.13

org.flywaydb flyway-core 3.2.1

org.freemarker freemarker 2.3.26-incubating

org.glassfish javax.el 3.0.0

org.glassfish.jersey.bundljer.sreeyp-agcukaavgaed org.glassfish.jersey.contajienresresy-container-

servlet

org.glassfish.jersey.contajienresresy-container-

servlet-core

2.25.1

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org.glassfish.jersey.corejersey-client 2.25.1

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org.glassfish.jersey.corejersey-common 2.25.1

org.glassfish.jersey.corejersey-server 2.25.1

org.glassfish.jersey.ext jersey-bean-validation 2.25.1

org.glassfish.jersey.ext jersey-entity-filtering 2.25.1

org.glassfish.jersey.ext jersey-spring3 2.25.1

org.glassfish.jersey.mediajersey-media-jaxb 2.25.1

org.glassfish.jersey.mediajersey-media-json-

jackson

2.25.1

org.glassfish.jersey.mediajersey-media-multipart 2.25.1

org.hamcrest hamcrest-core 1.3

org.hamcrest hamcrest-library 1.3

org.hibernate hibernate-core 5.0.12.Final

org.hibernate hibernate-ehcache 5.0.12.Final

org.hibernate hibernate-entitymanager 5.0.12.Final

org.hibernate hibernate-envers 5.0.12.Final

org.hibernate hibernate-java8 5.0.12.Final

org.hibernate hibernate-jpamodelgen 5.0.12.Final

org.hibernate hibernate-validator 5.3.5.Final

org.hibernate hibernate-validator- annotation-processor

5.3.5.Final

org.hsqldb hsqldb 2.3.5

org.infinispan infinispan-jcache 8.2.8.Final

org.infinispan infinispan-spring4- common

org.infinispan infinispan-spring4- embedded

8.2.8.Final

8.2.8.Final

org.javassist javassist 3.21.0-GA

org.jboss jboss-transaction-spi 7.6.0.Final

org.jboss.logging jboss-logging 3.3.1.Final

org.jboss.narayana.jta jdbc 5.5.30.Final

org.jboss.narayana.jta jms 5.5.30.Final

org.jboss.narayana.jta jta 5.5.30.Final

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| **Group ID** | **Artifact ID** | **Version** |
| org.jboss.narayana.jts  org.jdom | narayana-jts- integration  jdom2 | 5.5.30.Final  2.0.6 |
| org.jolokia  org.jooq | jolokia-core  jooq | 1.3.7  3.9.6 |
| org.jooq | jooq-codegen | 3.9.6 |
| org.jooq  org.json | jooq-meta  json | 3.9.6  20140107 |
| org.liquibase  org.mariadb.jdbc | liquibase-core  mariadb-java-client | 3.5.3  1.5.9 |
| org.mockito | mockito-core | 1.10.19 |
| org.mongodb | mongodb-driver | 3.4.3 |
| org.mongodb | mongo-java-driver | 3.4.3 |
| org.mortbay.jasper  org.neo4j | apache-el  neo4j-ogm-api | 8.0.33  2.1.5 |
| org.neo4j | neo4j-ogm-compiler | 2.1.5 |
| org.neo4j | neo4j-ogm-core | 2.1.5 |
| org.neo4j | neo4j-ogm-http-driver | 2.1.5 |
| org.postgresql  org.projectlombok | postgresql  lombok | 9.4.1212.jre7  1.16.18 |
| org.seleniumhq.selenium | htmlunit-driver | 2.21 |
| org.seleniumhq.selenium | selenium-api | 2.53.1 |
| org.seleniumhq.selenium  org.seleniumhq.selenium | selenium-chrome-driver  selenium-firefox-driver | 2.53.1  2.53.1 |
| org.seleniumhq.selenium  org.seleniumhq.selenium | selenium-ie-driver  selenium-java | 2.53.1  2.53.1 |
| org.seleniumhq.selenium | selenium-remote-driver | 2.53.1 |
| org.seleniumhq.selenium  org.seleniumhq.selenium | selenium-safari-driver  selenium-support | 2.53.1  2.53.1 |
| org.skyscreamer | jsonassert | 1.4.0 |
| org.slf4j | jcl-over-slf4j | 1.7.25 |

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| **Group ID** | **Artifact ID** | **Version** |
| org.slf4j  org.slf4j | jul-to-slf4j  log4j-over-slf4j | 1.7.25  1.7.25 |
| org.slf4j  org.slf4j | slf4j-api  slf4j-ext | 1.7.25  1.7.25 |
| org.slf4j | slf4j-jcl | 1.7.25 |
| org.slf4j  org.slf4j | slf4j-jdk14  slf4j-log4j12 | 1.7.25  1.7.25 |
| org.slf4j  org.slf4j | slf4j-nop  slf4j-simple | 1.7.25  1.7.25 |
| org.spockframework | spock-core | 1.0-groovy-2.4 |
| org.spockframework | spock-spring | 1.0-groovy-2.4 |
| org.springframework | spring-aop | 4.3.12.RELEASE |
| org.springframework  org.springframework | spring-aspects  spring-beans | 4.3.12.RELEASE  4.3.12.RELEASE |
| org.springframework | spring-context | 4.3.12.RELEASE |
| org.springframework | spring-context-support | 4.3.12.RELEASE |
| org.springframework | spring-core | 4.3.12.RELEASE |
| org.springframework  org.springframework | spring-expression  spring-instrument | 4.3.12.RELEASE  4.3.12.RELEASE |
| org.springframework | spring-instrument- tomcat | 4.3.12.RELEASE |
| org.springframework | spring-jdbc | 4.3.12.RELEASE |
| org.springframework  org.springframework | spring-jms  springloaded | 4.3.12.RELEASE  1.2.8.RELEASE |
| org.springframework  org.springframework | spring-messaging  spring-orm | 4.3.12.RELEASE  4.3.12.RELEASE |
| org.springframework | spring-oxm | 4.3.12.RELEASE |
| org.springframework  org.springframework | spring-test  spring-tx | 4.3.12.RELEASE  4.3.12.RELEASE |
| org.springframework | spring-web | 4.3.12.RELEASE |
| org.springframework | spring-webmvc | 4.3.12.RELEASE |

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| **Group ID** | **Artifact ID** | **Version** |
| org.springframework  org.springframework | spring-webmvc-portlet  spring-websocket | 4.3.12.RELEASE  4.3.12.RELEASE |
| org.springframework.amqp  org.springframework.amqp | spring-amqp  spring-rabbit | 1.7.4.RELEASE  1.7.4.RELEASE |
| org.springframework.batc | hspring-batch-core 3.0.8.RELEASE | |
| org.springframework.batc  org.springframework.batc | hspring-batch- infrastructure  hspring-batch- integration | 3.0.8.RELEASE  3.0.8.RELEASE |
| org.springframework.batc  org.springframework.boot | hspring-batch-test  spring-boot | 3.0.8.RELEASE  1.5.8.RELEASE |
| org.springframework.boot | spring-boot-actuator | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-actuator- docs | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot- autoconfigure | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot- | 1.5.8.RELEASE |
|  | autoconfigure-processor |  |
| org.springframework.boot | spring-boot- | 1.5.8.RELEASE |
|  | configuration-metadata |  |
| org.springframework.boot | spring-boot- configuration-processor | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-devtools | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-loader | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-loader- tools | 1.5.8.RELEASE |
| org.springframework.boot org.springframework.boot | spring-boot-starter  spring-boot-starter- activemq | 1.5.8.RELEASE  1.5.8.RELEASE |
| org.springframework.boot | spring-boot-starter- actuator | 1.5.8.RELEASE |
| org.springframework.boot  org.springframework.boot | spring-boot-starter- amqp  spring-boot-starter-aop | 1.5.8.RELEASE  1.5.8.RELEASE |

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| **Group ID** | **Artifact ID** | **Version** |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | artemis |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | batch |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | cache |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | cloud-connectors |  |
| org.springframework.boot | spring-boot-starter- data-cassandra | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | data-couchbase |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | data-elasticsearch |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | data-gemfire |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | data-jpa |  |
| org.springframework.boot | spring-boot-starter- data-ldap | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-starter- data-mongodb | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-starter- data-neo4j | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | data-redis |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | data-rest |  |
| org.springframework.boot | spring-boot-starter- data-solr | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-starter- freemarker | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | groovy-templates |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | hateoas |  |

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| **Group ID** | **Artifact ID** | **Version** |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | integration |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | jdbc |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | jersey |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | jetty |  |
| org.springframework.boot | spring-boot-starter- jooq | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | jta-atomikos |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | jta-bitronix |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | jta-narayana |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | log4j2 |  |
| org.springframework.boot | spring-boot-starter- logging | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-starter- mail | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-starter- mobile | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | mustache |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | remote-shell |  |
| org.springframework.boot | spring-boot-starter- security | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-starter- social-facebook | 1.5.8.RELEASE |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | social-linkedin |  |
| org.springframework.boot | spring-boot-starter- | 1.5.8.RELEASE |
|  | social-twitter |  |

**Group ID Artifact ID Version**

org.springframework.boot spring-boot-starter-

test

org.springframework.boot spring-boot-starter-

thymeleaf

org.springframework.boot spring-boot-starter-

tomcat

org.springframework.boot spring-boot-starter-

undertow

org.springframework.boot spring-boot-starter-

validation

1.5.8.RELEASE

1.5.8.RELEASE

1.5.8.RELEASE

1.5.8.RELEASE

1.5.8.RELEASE

org.springframework.boot spring-boot-starter-web 1.5.8.RELEASE

org.springframework.boot spring-boot-starter-

web-services

org.springframework.boot spring-boot-starter-

websocket

1.5.8.RELEASE

1.5.8.RELEASE

org.springframework.boot spring-boot-test 1.5.8.RELEASE

org.springframework.boot spring-boot-test-

autoconfigure

org.springframework.cloudspring-cloud-

cloudfoundry-connector

1.5.8.RELEASE

1.2.4.RELEASE

org.springframework.cloudspring-cloud-core 1.2.4.RELEASE

org.springframework.cloudspring-cloud-heroku-

connector

org.springframework.cloudspring-cloud-

localconfig-connector

org.springframework.cloudspring-cloud-spring-

service-connector

1.2.4.RELEASE

1.2.4.RELEASE

1.2.4.RELEASE

org.springframework.data spring-cql 1.5.8.RELEASE org.springframework.data spring-data-cassandra 1.5.8.RELEASE org.springframework.data spring-data-commons 1.13.8.RELEASE org.springframework.data spring-data-couchbase 2.2.8.RELEASE

org.springframework.data spring-data-

elasticsearch

2.1.8.RELEASE

org.springframework.data spring-data-envers 1.1.8.RELEASE

org.springframework.data spring-data-gemfire 1.9.8.RELEASE

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| **Group ID** | **Artifact ID** | **Version** |
| org.springframework.data | spring-data-jpa | 1.11.8.RELEASE |
| org.springframework.data | spring-data-keyvalue | 1.2.8.RELEASE |
| org.springframework.data | spring-data-ldap | 1.0.8.RELEASE |
| org.springframework.data | spring-data-mongodb | 1.10.8.RELEASE |
| org.springframework.data | spring-data-mongodb- cross-store | 1.10.8.RELEASE |
| org.springframework.data | spring-data-mongodb- log4j | 1.10.8.RELEASE |
| org.springframework.data | spring-data-neo4j | 4.2.8.RELEASE |
| org.springframework.data | spring-data-redis | 1.8.8.RELEASE |
| org.springframework.data | spring-data-rest-core | 2.6.8.RELEASE |
| org.springframework.data | spring-data-rest-hal- browser | 2.6.8.RELEASE |
| org.springframework.data | spring-data-rest-webmvc | 2.6.8.RELEASE |
| org.springframework.data | spring-data-solr | 2.1.8.RELEASE |

org.springframework.hateoasspring-hateoas 0.23.0.RELEASE org.springframework.integrsaptrinng-integration-amqp 4.3.12.RELEASE org.springframework.integrsaptrinng-integration-core 4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-

event

4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-feed 4.3.12.RELEASE org.springframework.integrsaptrinng-integration-file 4.3.12.RELEASE org.springframework.integrsaptrinng-integration-ftp 4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-

gemfire

org.springframework.integrsaptrinng-integration-

groovy

4.3.12.RELEASE

4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-http 4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-ip 4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-

java-dsl

1.2.3.RELEASE

org.springframework.integrsaptrinng-integration-jdbc 4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-jms 4.3.12.RELEASE

**Group ID Artifact ID Version** org.springframework.integrsaptrinng-integration-jmx 4.3.12.RELEASE org.springframework.integrsaptrinng-integration-jpa 4.3.12.RELEASE org.springframework.integrsaptrinng-integration-mail 4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-

mongodb

4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-mqtt 4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-

redis

4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-rmi 4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-

scripting

org.springframework.integrsaptrinng-integration-

security

4.3.12.RELEASE

4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-sftp 4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-

stomp

org.springframework.integrsaptrinng-integration-

stream

org.springframework.integrsaptrinng-integration-

syslog

4.3.12.RELEASE

4.3.12.RELEASE

4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-test 4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-

twitter

org.springframework.integrsaptrinng-integration-

websocket

4.3.12.RELEASE

4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-ws 4.3.12.RELEASE org.springframework.integrsaptrinng-integration-xml 4.3.12.RELEASE org.springframework.integrsaptrinng-integration-xmpp 4.3.12.RELEASE

org.springframework.integrsaptrinng-integration-

zookeeper

4.3.12.RELEASE

org.springframework.kafkaspring-kafka 1.1.7.RELEASE org.springframework.kafkaspring-kafka-test 1.1.7.RELEASE org.springframework.ldap spring-ldap-core 2.3.2.RELEASE org.springframework.ldap spring-ldap-core-tiger 2.3.2.RELEASE

**Group ID Artifact ID Version** org.springframework.ldap spring-ldap-ldif-batch 2.3.2.RELEASE org.springframework.ldap spring-ldap-ldif-core 2.3.2.RELEASE org.springframework.ldap spring-ldap-odm 2.3.2.RELEASE

org.springframework.ldap spring-ldap-test 2.3.2.RELEASE org.springframework.mobilespring-mobile-device 1.1.5.RELEASE org.springframework.pluginspring-plugin-core 1.2.0.RELEASE org.springframework.pluginspring-plugin-metadata 1.2.0.RELEASE org.springframework.restdoscpsring-restdocs-core 1.1.3.RELEASE org.springframework.restdoscpsring-restdocs-mockmvc 1.1.3.RELEASE

org.springframework.restdoscpsring-restdocs-

restassured

1.1.3.RELEASE

org.springframework.retryspring-retry 1.2.1.RELEASE org.springframework.securistpyring-security-acl 4.2.3.RELEASE org.springframework.securistpyring-security-aspects 4.2.3.RELEASE org.springframework.securistpyring-security-cas 4.2.3.RELEASE org.springframework.securistpyring-security-config 4.2.3.RELEASE org.springframework.securistpyring-security-core 4.2.3.RELEASE org.springframework.securistpyring-security-crypto 4.2.3.RELEASE org.springframework.securistpyring-security-data 4.2.3.RELEASE org.springframework.securistpyring-security-jwt 1.0.8.RELEASE org.springframework.securistpyring-security-ldap 4.2.3.RELEASE

org.springframework.securistpyring-security-

messaging

4.2.3.RELEASE

org.springframework.securistpyring-security-openid 4.2.3.RELEASE

org.springframework.securistpyring-security-

remoting

4.2.3.RELEASE

org.springframework.securistpyring-security-taglibs 4.2.3.RELEASE org.springframework.securistpyring-security-test 4.2.3.RELEASE org.springframework.securistpyring-security-web 4.2.3.RELEASE org.springframework.securistpyr.ionagu-tshecurity-oauth 2.0.14.RELEASE org.springframework.securistpyr.ionagu-tshecurity-oauth2 2.0.14.RELEASE

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org.springframework.sessiosnpring-session 1.3.1.RELEASE

org.springframework.sessiosnpring-session-data-

gemfire

org.springframework.sessiosnpring-session-data-

mongo

org.springframework.sessiosnpring-session-data-

redis

org.springframework.sessiosnpring-session-

hazelcast

1.3.1.RELEASE

1.3.1.RELEASE

1.3.1.RELEASE

1.3.1.RELEASE

org.springframework.sessiosnpring-session-jdbc 1.3.1.RELEASE org.springframework.socialspring-social-config 1.1.4.RELEASE org.springframework.socialspring-social-core 1.1.4.RELEASE org.springframework.socialspring-social-facebook 2.0.3.RELEASE

org.springframework.socialspring-social-facebook-

web

2.0.3.RELEASE

org.springframework.socialspring-social-linkedin 1.0.2.RELEASE org.springframework.socialspring-social-security 1.1.4.RELEASE org.springframework.socialspring-social-twitter 1.1.2.RELEASE org.springframework.socialspring-social-web 1.1.4.RELEASE org.springframework.ws spring-ws-core 2.4.0.RELEASE org.springframework.ws spring-ws-security 2.4.0.RELEASE org.springframework.ws spring-ws-support 2.4.0.RELEASE org.springframework.ws spring-ws-test 2.4.0.RELEASE org.thymeleaf thymeleaf 2.1.5.RELEASE org.thymeleaf thymeleaf-spring4 2.1.5.RELEASE

org.thymeleaf.extras thymeleaf-extras-

conditionalcomments

org.thymeleaf.extras thymeleaf-extras-

java8time

org.thymeleaf.extras thymeleaf-extras-

springsecurity4

2.1.2.RELEASE

2.1.0.RELEASE

2.1.3.RELEASE

org.webjars hal-browser 9f96c74

org.webjars webjars-locator 0.32-1

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| **Group ID** | **Artifact ID** | **Version** |
| org.xerial | sqlite-jdbc | 3.15.1 |
| org.yaml | snakeyaml | 1.17 |
| redis.clients | jedis | 2.9.0 |
| wsdl4j | wsdl4j | 1.6.3 |
| xml-apis | xml-apis | 1.4.01 |