



链滴

GraalVM 与 Spring Native 初体验，一个让你的应用在 100ms 内启动的神器

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<p>
先吹一波截图，当中 springboot 的启动只用了 0.036 秒，问如果没有 Spring Native，谁还能做到。
即使是 M1 Mac Pro 启动也是需要 0.559 秒。两张片的时间差距比较久是因为在写博客的时候，突发奇想想把 solo 博客也给做成 GraalVM 的，但是很可惜失败了，这里省略几百字的小作文，但是会提到为什么失败了。
</p><script async src="https://pagead2.googlesyndication.com/pagead/js/adsbygoogle.js?client=a-pub-5357405790190342" crossorigin="anonymous"></script><!-- 黑客派PC帖子内嵌 --><ins class="adsbygoogle" style="display:block" data-ad-client="ca-pub-5357405790190342" data-ad-slot="8316640078" data-ad-format="auto" data-full-width-responsive="true"></ins><script> (adsbygoogle = window.adsbygoogle || []).push({}); </script><h2 id="1--一些背景知识">1. 一些背景知识</h2><h3 id="1-1-GraalVM">1.1 GraalVM</h3><p>GraalVM 在官方网站对自己的介绍是 <code>High Performance. Cloud Native. Polyglot</code> 意思就是 高性能，云原生，多语言。</p><p>GraalVM for Java 具有新的编译器优化的高性能 runtime，以加速 Java 应用程序性能和较低的设施成本以及云中的基础设施成本。Graalvm 是 Java 和其他 JVM 语言的高性能 runtime。它包含一个兼容的 JDK，并提供基于 Java 8（仅 GRAALVM Enterprise Edition），Java 11 和 Java 17 Graalvm 提供多个编译器优化的分布，旨在加速 Java 应用程序性能，同时消耗更少的资源。要开始使用 Graalvm，或从另一个 JDK 分发迁移，您不必更改任何源代码。在 Java Hotspot VM 上运行的任何应用程序将在 Graalvm 上运行。</p><p>很官方啊，这样的话。说的明白点就是 GraalVM 是一个共享运行时间的生态系统，无论是那些依赖于 JVM 的语言（Java、Scala、Groovy、Kotlin）还是说其他的编程语言例如（JavaScript、Ruby、Python、R）有性能上的优势。另外，GraalVM 能够通过一种前端的 LLVM 执行 JVM 上面的原生代码。</p><h2 id="2--安装GraalVM">2. 安装 GraalVM</h2><p>这里会说到 Windows, Mac, linux 下的安装过程。</p><h3 id="2-1-下载">2.1 下载</h3><p>地址</p><p>找到你电脑安装的 Jdk 的版本进行下载</p><p></p><p>这里推荐安装 Java11, Java17 的版本我安装之后发现问题，在我改成 Java11 后没有修改其配置的情况下却又成功了。</p><h3 id="2-2-安装">2.2 安装</h3><p>官方英文版</p><h4 id="linux-and-mac">linux and mac</h4><p>这里 linux 和 mac 下一起讲是因为差不多，会其中一个，另一个你也可以延展的去安装。</p><p>下载解压后，放在和你的 JDK 同一级目录下，如：</p><pre><code class="highlight-chroma"><span class="highlight

```
cl">tar -xzf &lt;graalvm-archive&gt;.tar.gz
```

```
</span></span></code></pre>
```

<p></p>

<p>更改环境变量</p>

<p>linux, 以 centos 为例就是更改 <code>/etc/profile</code> 文件, macOS 下就是更改 <code>~/.zshrc</code> 文件, 在这里需要把你之前安装的 JDK 时配置的 <code>JAVA_HOME</code> 进行修改为: GraalVM 的地址</p>

```
<pre><code class="highlight-chroma"><span class="highlight-line"><span class="highlight-cl">export JAVA_HOME=/Users/asher/workspace/software/jdk/graalvm-ce-java11-21.3.0/Contents/Home
```

```
</span></span></code></pre>
```

<p>然后在 PATH 路径进行添加</p>

```
<pre><code class="language-bash highlight-chroma"><span class="highlight-line"><span class="highlight-cl"><span class="highlight-nb">export</span> <span class="highlight-nv">PATH</span><span class="highlight-o">=</span><span class="highlight-nv">$PATH</span><span class="highlight-nv">$MAVEN_HOME</span>/bin:<span class="highlight-nv">$FFPEG_HOME</span>/bin:/Users/asher/workspace/software/jdk/graalvm-ce-java11-21.3.0/Contents/Home/bin:<span class="highlight-nv">$JAVA_HOME</span>:</span></span></code></pre>
```

<p>注意, 我在上面添加了 <code>/Users/asher/workspace/software/jdk/graalvm-ce-java11-21.3.0/Contents/Home/bin</code> 的路径, 这个是需要进行添加的</p>

<p>centos 下别忘了 <code>source /etc/profile</code></p>

<p>解压下载的文件</p> <p>然后 win+R 打开你的命令行</p> <p><code>setx /M JAVA_HOME "C:\Progra~1\Java\<graalvm>"</code></p> <p>配置环境变量</p> <p><code>setx /M PATH "C:\Progra~1\Java\<graalvm>\bin;%PATH%"</code></p> <p>当你安装配置完成之后, 打开新的命令行窗口, 执行 <code>java -version</code></p> <p>就会发现 JDK 已经改成了新安装的那个了,类似如下截图</p> <p></p> <p>已经安装完成之后, 我们从最简单的 Hello World 开始, 体会一下 GraalVM 和 JVM 的区别</p> > <p>新建一个 Java 文件, <code>HelloWorld.java</code></p> <p>然后输入</p> ``` <pre><code class="language-java highlight-chroma">public class HelloWorld {</pre> ``` ``` public static void main(String[] args){</pre> ``` ``` System .out.println("Hello, World!" ``` 原文链接: [GraalVM 与 Spring Native 初体验, 一个让你的应用在 100ms 内启动的神器](#)

```
ass="highlight-o">);</span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="hi
hlight-o">}</span>
</span></span><span class="highlight-line"><span class="highlight-cl"><span class="high
ight-o">}</span>
</span></span></code></pre>
<h4 id="3-1-JVM版">3.1 JVM 版</h4>
<p>我们需要 <code>javac HelloWorld.java</code>, 然后 <code>java HelloWorld</code>,
们用记录一下<br> <code>java HelloWorld</code> 所需要的时间<br> <br> 总计 0.077 秒</p>
<h4 id="3-2-GraalVM版">3.2 GraalVM 版</h4>
<p>先进行安装 <code>native-image</code></p>
<pre><code class="language-bash highlight-chroma"><span class="highlight-line"><span c
ass="highlight-cl">gu install native-image
</span></span></code></pre>
<p>然后在刚刚编译 HelloWorld 的目录下进行执行</p>
<pre><code class="language-bash highlight-chroma"><span class="highlight-line"><span c
ass="highlight-cl">native-image HelloWorld
</span></span></code></pre>
<p>等待一段时间, 此时会直接生成一个可执行文件</p>
<p><
p>
<p>等待一段时间后, 我们会发现文件生成了</p>
<p></
>
<p>让我们执行看看</p>
<p></
>
<p>完全没问题, 再测试一下时间呢</p>
<p></
>
<p>0.063 秒! 拿出之前和 JVM 执行的对比一下,它在执行的时候, 用户态和系统态使用的时间都低于
JVM</p>
<p></
>
<p>虽说 GraalVM 确实快了, 但是你也注意到了, 当执行的 <code>native-image HelloWorld</c
ode> 时候会有好几个阶段, 而且都很耗时间跟内存。</p>
<h2 id="4--进阶版--Maven-插件编译">4. 进阶版, Maven 插件编译</h2>
<p>看完了上面的, 你可能觉得差距不大, 毕竟这几微秒的事, 咱们都体会不出来。</p>
<p>这里会说到的是在我们常见的 Maven 项目如何进行使用 GraalVM。</p>
<p>让我们新建一个 Maven 项目, 整个程序的目录结构是这样的, 只有一个 <code>Application.jav
</code> 和一个 <code>Person.java</code> 文件</p>
<p></
>
<h3 id="4-1-pom-xml">4.1 pom.xml</h3>
<p>因为这里我们要使用 maven plugin 进行打包, 加入了 dependency <code>graal-sdk</code
,然后引入了 <code>native-image-maven-plugin</code></p>
```



```

</span></span><span class="highlight-line"><span class="highlight-cl">           <s
an class="highlight-nt">&lt;goals&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
span class="highlight-nt">&lt;goal&gt;</span>native-image<span class="highlight-nt">&lt;
goal&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <s
an class="highlight-nt">&lt;/goals&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <s
an class="highlight-nt">&lt;phase&gt;</span>package<span class="highlight-nt">&lt;/phas
&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span
class="highlight-nt">&lt;/execution&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span c
lass="highlight-nt">&lt;/executions&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span c
lass="highlight-nt">&lt;configuration&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span
class="highlight-nt">&lt;skip&gt;</span>>false<span class="highlight-nt">&lt;/skip&gt;</sp
n>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span
class="highlight-nt">&lt;imageName&gt;</span>graalvmMaven<span class="highlight-nt"
&lt;/imageName&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span
class="highlight-nt">&lt;mainClass&gt;</span>run.runnable.Application<span class="highli
ht-nt">&lt;/mainClass&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span
class="highlight-nt">&lt;buildArgs&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           --n
-fallback
</span></span><span class="highlight-line"><span class="highlight-cl">           <span
class="highlight-nt">&lt;/buildArgs&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span c
lass="highlight-nt">&lt;/configuration&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span clas
="highlight-nt">&lt;/plugin&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span class=
highlight-nt">&lt;/plugins&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span class="h
ghlight-nt">&lt;/build&gt;</span>
</span></span></code></pre>
<p>然后的话我们还需要在 IDEA 中进行配置编译的 Java 版本是下载的 GraalVM 下的 Java</p>
<p><
p>
<p>修改之后我们在项目中加一些代码试试。这里的话，我新建了一个 Person 实体类和 Application
启动类。代码如下</p>
<p>Person.java</p>
<pre><code class="language-java highlight-chroma"><span class="highlight-line"><span c
lass="highlight-cl"><span class="highlight-kn">package</span> <span class="highlight-nn"
>run.runnable.entity</span> <span class="highlight-o">;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"><span class="high
light-cm">/**
</span></span></span><span class="highlight-line"><span class="highlight-cl"><span cla

```

```

s="highlight-cm"> * @author Asher
</span></span></span><span class="highlight-line"><span class="highlight-cl"><span cla
s="highlight-cm"> * on 2021/12/23
</span></span></span><span class="highlight-line"><span class="highlight-cl"><span cla
s="highlight-cm"> */</span>
</span></span><span class="highlight-line"><span class="highlight-cl"><span class="high
ight-kd">public</span> <span class="highlight-kd">class</span> <span class="highlight-n
">Person</span> <span class="highlight-o">{</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="h
ghlight-kd">private</span> <span class="highlight-n">Integer</span> <span class="highli
ht-n">id</span><span class="highlight-o">;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="h
ghlight-kd">private</span> <span class="highlight-n">String</span> <span class="highlig
ht-n">name</span><span class="highlight-o">;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="h
ghlight-kd">public</span> <span class="highlight-n">String</span> <span class="highligh
-nf">getName</span><span class="highlight-o">()</span> <span class="highlight-o">{</sp
pan>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class=
highlight-k">return</span> <span class="highlight-n">name</span><span class="highligh
-o">;</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="h
ghlight-o">}</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="h
ghlight-kd">public</span> <span class="highlight-kt">void</span> <span class="highlight
nf">setName</span><span class="highlight-o">(</span><span class="highlight-n">String
/span> <span class="highlight-n">name</span><span class="highlight-o">)</span> <span
class="highlight-o">{</span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class=
highlight-k">this</span><span class="highlight-o">.</span><span class="highlight-na">n
me</span> <span class="highlight-o">=</span> <span class="highlight-n">name</span>
span class="highlight-o">;</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="h
ghlight-o">}</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="h
ghlight-kd">public</span> <span class="highlight-n">Integer</span> <span class="highli
ht-nf">getId</span><span class="highlight-o">()</span> <span class="highlight-o">{</sp
n>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class=
highlight-k">return</span> <span class="highlight-n">id</span><span class="highlight-o
">;</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="h
ghlight-o">}</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="h
ghlight-kd">public</span> <span class="highlight-kt">void</span> <span class="highlight
nf">setId</span><span class="highlight-o">(</span><span class="highlight-n">Integer</s
an> <span class="highlight-n">id</span><span class="highlight-o">)</span> <span class=
highlight-o">{</span>

```

```

</span></span><span class="highlight-line"><span class="highlight-cl">    <span class="highlight-k">this</span><span class="highlight-o">.</span><span class="highlight-na">i
</span> <span class="highlight-o">=</span> <span class="highlight-n">id</span><span class="highlight-o">;</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl">    <span class="highlight-o">}</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl">    <span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl">    <span class="highlight-nd">@Override</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl">    <span class="highlight-nd">public</span><span class="highlight-n">String</span><span class="highlight-nf">toString</span><span class="highlight-o">()</span><span class="highlight-o">{</span></span>
an>
</span></span><span class="highlight-line"><span class="highlight-cl">    <span class="highlight-k">return</span><span class="highlight-s">"Person{"</span><span class="highlight-o">+</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl">    <span class="highlight-s">"id="</span><span class="highlight-o">+</span><span class="highlight-n">id</span><span class="highlight-o">+</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl">    <span class="highlight-s">"," name="</span><span class="highlight-o">+</span><span class="highlight-n">name</span><span class="highlight-o">+</span><span class="highlight-sc">'\
'</span><span class="highlight-o">+</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl">    <span class="highlight-sc">'}</span><span class="highlight-o">;</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl">    <span class="highlight-o">}</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl"><span class="highlight-o">}</span></span>
</span></span></code></pre>
<script async src="https://pagead2.googlesyndication.com/pagead/js/adsbygoogle.js?client=a-pub-5357405790190342" crossorigin="anonymous"></script> <!-- 黑客派PC帖子内嵌 -->
<ins class="adsbygoogle" style="display:block" data-ad-client="ca-pub-5357405790190342" data-ad-slot="8316640078" data-ad-format="auto" data-full-width-responsive="true"></in
>
</script>
(adsbygoogle = window.adsbygoogle || []).push({});
</script>
<p>Application</p>
<pre><code class="language-java highlight-chroma"><span class="highlight-line"><span class="highlight-cl"><span class="highlight-kn">package</span><span class="highlight-nd">run.runnable</span><span class="highlight-o">;</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"><span class="highlight-kn">import</span><span class="highlight-nd">run.runnable.entity.Person</span><span class="highlight-o">;</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"><span class="highlight-kn">import</span><span class="highlight-nd">java.util.ArrayList</span><span class="highlight-o">;</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl"><span class="highlight-kn">import</span><span class="highlight-nd">java.util.List</span><span class="highlight-o">;</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl"><span class="highlight-o">}</span></span>
</span></span></code></pre>

```



```

import</span> <span class="highlight-nn">java.util.stream.Collectors</span><span class="highlight-o">;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"><span class="highlight-cm">/**
</span></span></span><span class="highlight-line"><span class="highlight-cl"><span class="highlight-cm"> * @author Asher
</span></span></span><span class="highlight-line"><span class="highlight-cl"><span class="highlight-cm"> * on 2021/12/23
</span></span></span><span class="highlight-line"><span class="highlight-cl"><span class="highlight-cm"> */</span></span></span>
</span></span><span class="highlight-line"><span class="highlight-cl"><span class="highlight-cl"><span class="highlight-kd">public</span> <span class="highlight-kd">class</span> <span class="highlight-n">Application</span> <span class="highlight-o">{</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-kd">public</span> <span class="highlight-kd">static</span> <span class="highlight-kt">void</span> <span class="highlight-nf">main</span> <span class="highlight-o">(</span>
</span></span><span class="highlight-n">String</span><span class="highlight-o">[]</span><span class="highlight-n">args</span><span class="highlight-o">)</span> <span class="highlight-o">{</span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-n">List</span><span class="highlight-o">&lt;&lt;</span><span class="highlight-n">person</span> <span class="highlight-o">&gt;&gt;</span> <span class="highlight-n">personList</span>
</span></span><span class="highlight-o">=</span><span class="highlight-k">new</span> <span class="highlight-n">ArrayList</span><span class="highlight-o">&lt;&lt;&gt;&gt;</span>()</span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-k">for</span> <span class="highlight-o">(</span><span class="highlight-kt">in</span>
</span></span><span class="highlight-n">i</span><span class="highlight-o">=</span><span class="highlight-n">0</span><span class="highlight-o">;</span><span class="highlight-n">i</span><span class="highlight-o">&lt;&lt;</span><span class="highlight-n">10_000</span>
</span></span><span class="highlight-o">;</span><span class="highlight-n">i</span><span class="highlight-o">+&plus;&plus;</span><span class="highlight-o">}</span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-n">Person</span> <span class="highlight-n">person</span> <span class="highlight-o">=</span><span class="highlight-k">new</span> <span class="highlight-n">Person</span>
</span></span><span class="highlight-o">();</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-n">person</span><span class="highlight-o">.</span><span class="highlight-a">setId</span><span class="highlight-o">(</span><span class="highlight-n">i</span><span class="highlight-o">);</span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-n">person</span><span class="highlight-o">.</span><span class="highlight-a">setName</span><span class="highlight-o">(</span><span class="highlight-s">"jack"</span>
</span></span><span class="highlight-o">+</span><span class="highlight-n">i</span><span class="highlight-o">);</span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-n">personList</span><span class="highlight-o">.</span><span class="highlight-tna">add</span><span class="highlight-o">(</span><span class="highlight-n">person</span>
</span></span><span class="highlight-o">);</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-o">}</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-n">List</span><span class="highlight-o">&lt;&lt;</span><span class="highlight-n">

```

```

erson</span> <span class="highlight-o">&gt;</span> <span class="highlight-n">collectPer
onList</span> <span class="highlight-o">=</span> <span class="highlight-n">personList<
span><span class="highlight-o">.</span><span class="highlight-na">stream</span><span
class="highlight-o">)</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span c
lass="highlight-o">.</span><span class="highlight-na">filter</span><span class="highlig
ht-o">(</span><span class="highlight-n">person</span> <span class="highlight-o">-&gt;</s
pan> <span class="highlight-n">person</span><span class="highlight-o">.</span><span c
lass="highlight-na">getId</span><span class="highlight-o">)</span> <span class="highli
ht-o">&gt;</span> <span class="highlight-n">5000</span><span class="highlight-o">)</
span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span c
lass="highlight-o">.</span><span class="highlight-na">collect</span><span class="highlig
ht-o">(</span><span class="highlight-n">Collectors</span><span class="highlight-o">.</s
an><span class="highlight-na">toList</span><span class="highlight-o">));</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span class=
highlight-n">System</span><span class="highlight-o">.</span><span class="highlight-na
>out</span><span class="highlight-o">.</span><span class="highlight-na">println</span>
<span class="highlight-o">(</span><span class="highlight-n">collectPersonList</span><span c
an class="highlight-o">);</span>
</span></span><span class="highlight-line"><span class="highlight-cl">           <span class="h
ghlight-o">}</span></span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="high
ght-o">}</span></span>
</span></span></code></pre>

```

这里代码逻辑很简单，就是新建了一个 personList，然后对其进行添加 10000 个，添加进去之，再对 id>5000 的进行过滤。

4.2 JVM 版

普通 maven 项目打成 jar 方法不再赘述，这里直接演示结果。

JVM 版用的是已经适配了 m1 的 zulu jdk，所以不用担心会由于转译引起的性能下降。

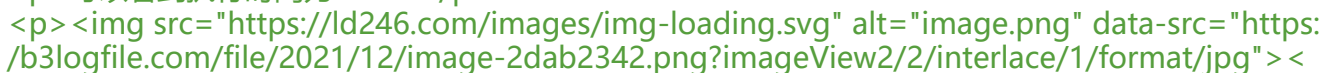

进行执行

```

<pre><code class="language-java highlight-chroma"><span class="highlight-line"><span c
lass="highlight-cl"><span class="highlight-n">time</span> <span class="highlight-n">java
/span> <span class="highlight-o">-</span><span class="highlight-n">jar</span> <span cl
ss="highlight-n">graalvmMaven</span><span class="highlight-o">-</span><span class="high
ghlight-n">1</span><span class="highlight-o">.</span><span class="highlight-na">0</sp
n><span class="highlight-o">-</span><span class="highlight-n">SNAPSHOT</span><span c
pan class="highlight-o">.</span><span class="highlight-na">jar</span>
</span></span></code></pre>

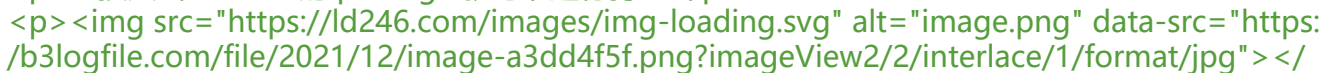

```

可以看到执行时间为 0.146



 

4.3 GraalVM 版本

直接点击 Maven 的 package 就可以进行打包

打包时间花了一分钟

接下来让我们执行打包生成的可执行文件

<p> </p>

<p>0.085 秒! 和 JVM 版的 0.146 秒相比, 花的时间差距也越来越明显了。 </p>

<p>在这个部分中, 甚至你本地都不用安装 GraalVM。 </p>

<p>在这一部分里会说到, 怎么将一个简单的 SpringBoot 项目进行打包成 docker 的 image, 这里推荐使用 window 下的 WSL2 进行, 因为这个过程非常吃资源。在 mac 下即使我给 docker 设置了 0G 运存, 4 核 CPU 仍然会莫名卡死在某一部分。 </p>

<p>当然如果你是 linux 主机那就更好了, 不用担心这个问题。 </p>

<p>让我们新建一个 SpringBoot 的简单项目。 </p>

<p>在 Spring Initializr 中我们选择 SpringBoot 的版本, 以及右侧我们选择 Spring Native 依赖, 和 Spring</p>

<p> </p>

<p>点击下面的生成会下载一个压缩包, 在工作目录进行解压, 然后导入到你的 IDEA 中。 </p>

<p>在生成的 pom 文件中, Spring 已经贴心帮我们配置都加好了。 </p>

<p>所以我只添加了一个 <code>spring-boot-starter-web</code> 的 dependency</p>

```
<pre><code class="language-xml highlight-chroma"><span class="highlight-line"><span cl ss="highlight-cl"><span class="highlight-cp">&lt;?xml version="1.0" encoding="UTF-8"?&gt;</span>
```

```
</span></span><span class="highlight-line"><span class="highlight-cl"><span class="high ight-nt">&lt;project</span> <span class="highlight-na">xmlns= </span><span class="highl ght-s">"http://maven.apache.org/POM/4.0.0"</span> <span class="highlight-na">xmlns:xsi </span><span class="highlight-s">"http://www.w3.org/2001/XMLSchema-instance"</span>
```

```
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="h ghlight-na">xsi:schemaLocation= </span><span class="highlight-s">"http://maven.apache.o g/POM/4.0.0 https://maven.apache.org/xsd/maven-4.0.0.xsd"</span><span class="highlight nt">&gt;</span>
```

```
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```

```
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```

```
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="high light-nt">&lt;groupId&gt;</span>org.springframework.boot<span class="highlight-nt" &lt;/groupId&gt;</span>
```

```
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```

```
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```
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```

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```

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```

```

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</span></span><span class="highlight-line"><span class="highlight-cl">
an class="highlight-nt">&lt;groupId&gt;</span>org.graalvm.buildtools<span class="highlig
t-nt">&lt;/groupId&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
an class="highlight-nt">&lt;artifactId&gt;</span>native-maven-plugin<span class="highligh
-nt">&lt;/artifactId&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
an class="highlight-nt">&lt;version&gt;</span>0.9.8<span class="highlight-nt">&lt;/versio
&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
an class="highlight-nt">&lt;extensions&gt;</span>true<span class="highlight-nt">&lt;/exte
sions&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
an class="highlight-nt">&lt;executions&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
span class="highlight-nt">&lt;execution&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
<span class="highlight-nt">&lt;id&gt;</span>test-native<span class="highlight-nt">&lt;/i
&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
<span class="highlight-nt">&lt;phase&gt;</span>test<span class="highlight-nt">&lt;/phas
&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
<span class="highlight-nt">&lt;goals&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
<span class="highlight-nt">&lt;goal&gt;</span>test<span class="highlight-nt">&lt;/goa
&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
<span class="highlight-nt">&lt;/goals&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
span class="highlight-nt">&lt;/execution&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
span class="highlight-nt">&lt;execution&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
<span class="highlight-nt">&lt;id&gt;</span>build-native<span class="highlight-nt">&lt;/i
&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
<span class="highlight-nt">&lt;phase&gt;</span>package<span class="highlight-nt">&lt;/
hase&gt;</span>

```

```

</span></span><span class="highlight-line"><span class="highlight-cl">
<span class="highlight-nt">&lt;/goals&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
  <span class="highlight-nt">&lt;/goal&gt;</span>build<span class="highlight-nt">&lt;/go
l&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
  <span class="highlight-nt">&lt;/goals&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
span class="highlight-nt">&lt;/execution&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
an class="highlight-nt">&lt;/executions&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
class="highlight-nt">&lt;/plugin&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
ass="highlight-nt">&lt;/plugins&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
="highlight-nt">&lt;/build&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
highlight-nt">&lt;/profile&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
ghlight-nt">&lt;/profiles&gt;</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"><span class="high
ight-nt">&lt;/project&gt;</span>
</span></span></code></pre>
<script async src="https://pagead2.googlesyndication.com/pagead/js/adsbygoogle.js?client=
a-pub-5357405790190342" crossorigin="anonymous"></script> <!-- 黑客派PC帖子内嵌 -->
<ins class="adsbygoogle" style="display:block" data-ad-client="ca-pub-5357405790190342"
data-ad-slot="8316640078" data-ad-format="auto" data-full-width-responsive="true"></in
>
<script>
  (adsbygoogle = window.adsbygoogle || []).push({});
</script>
<p>然后我们在启动类上添加一个 endpoint 进行返回</p>
<pre><code class="language-java highlight-chroma"><span class="highlight-line"><span c
ass="highlight-cl"><span class="highlight-nd">@SpringBootApplication</span>
</span></span><span class="highlight-line"><span class="highlight-cl"><span class="high
ight-nd">@Controller</span>
</span></span><span class="highlight-line"><span class="highlight-cl"><span class="high
ight-kd">public</span> <span class="highlight-kd">class</span> <span class="highlight-n
">ExperienceApplication</span> <span class="highlight-o">{</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl">
  <span class="highlight-kd">public</span> <span class="highlight-kd">static</span> <span class="highlig
ht-kt">void</span> <span class="highlight-nf">main</span>(<span class="highlight-o">(</
pan><span class="highlight-n">String</span><span class="highlight-o">[]</span> <span c
ass="highlight-n">args</span><span class="highlight-o">)</span> <span class="highlight
o">{</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
highlight-n">SpringApplication</span> <span class="highlight-o">.</span><span class="hi
hlight-na">run</span>(<span class="highlight-o">(</span><span class="highlight-n">Exper
enceApplication</span> <span class="highlight-o">.</span><span class="highlight-na">cla
s</span><span class="highlight-o">,</span> <span class="highlight-n">args</span><span c
lass="highlight-o">);</span>

```

```

</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-o">}</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-nd">@GetMapping</span><span class="highlight-o">(</span><span class="highlight-s">"hello"</span><span class="highlight-o">)</span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-nd">@ResponseBody</span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-kd">private</span> <span class="highlight-n">String</span> <span class="highlight-tnf">hello</span><span class="highlight-o">(){</span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-k">return</span> <span class="highlight-s">"hello world"</span><span class="highlight-o">;</span>
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-o">}</span>
</span></span><span class="highlight-line"><span class="highlight-cl">
</span></span><span class="highlight-line"><span class="highlight-cl"> <span class="highlight-o">}</span>
</span></span></code></pre>

```

现在你可以通过直接点击 IDEA 的 run，这样的话，是通过本地的 Java 进行运行的，获得一个 J M 版的启动时间。

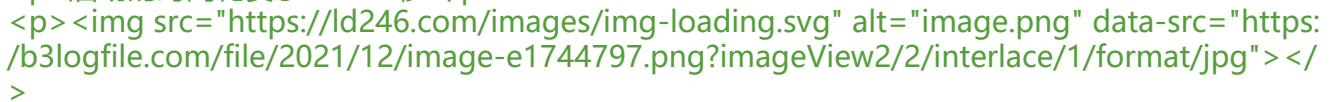
这里我的电脑配置是

```

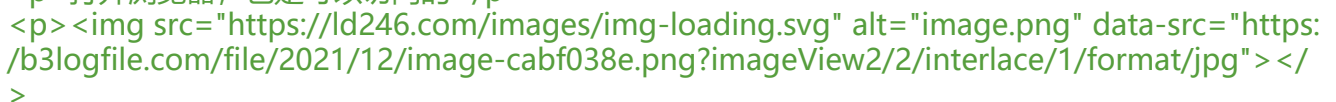
<pre><code class="highlight-chroma"><span class="highlight-line"><span class="highlight-cl">处理器 Intel(R) Core(TM) i5-8300H CPU @ 2.30GHz 2.30 GHz
</span></span><span class="highlight-line"><span class="highlight-cl">机带 RAM 32.0
B (31.9 GB 可用)
</span></span></code></pre>

```

启动的时间花费了 1.479 秒

 <https://ld246.com/images/img-loading.svg> alt="image.png" data-bbox="77 501 918 546"/> <https://b3logfile.com/file/2021/12/image-e1744797.png?imageView2/2/interlace/1/format/jpg>

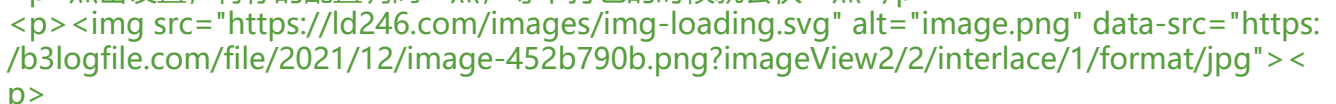
打开浏览器，也是可以访问的

 <https://ld246.com/images/img-loading.svg> alt="image.png" data-bbox="77 562 918 607"/> <https://b3logfile.com/file/2021/12/image-cabf038e.png?imageView2/2/interlace/1/format/jpg>

5.3 Spring Native 打包

接下来让我们进行 Spring Native 的打包工作。打开你的 win 下的 docker。

点击设置，将你的配置调高一点，等下打包的时候就会快一点

 <https://ld246.com/images/img-loading.svg> alt="image.png" data-bbox="77 655 918 701"/> <https://b3logfile.com/file/2021/12/image-452b790b.png?imageView2/2/interlace/1/format/jpg>

然后回到你的 IDEA，使用 cmd 窗口并进入到你的项目的目录

使用

```

<pre><code class="highlight-chroma"><span class="highlight-line"><span class="highlight-cl">mvn spring-boot:build-image
</span></span></code></pre>

```

或者指定 maven 的路径

```

<pre><code class="highlight-chroma"><span class="highlight-line"><span class="highlight-cl">D:\maven\apache-maven-3.8.4-bin\apache-maven-3.8.4\bin\mvn clean -U -DskipTests spr
ng-boot:build-image
</span></span></code></pre>

```

进行构建，接下来就是漫长的等待过程了。当中可能会出现一些错误，比如

5-4-Execution-default-cli-of-goal-org-springframework-boot-spring-boot-maven-pl

gin-2-6-1-build-image-failed--Builder-lifecycle--creator--failed-with-status-code-145">5.4 Execution default-cli of goal org.springframework.boot:spring-boot-maven-plugin:2.6.1:build-image failed: Builder lifecycle 'creator' failed with status code 145</h3>

<p></p>

<p>此时你需要检查</p>

你的本地运行环境的 JDK 版本，要和项目一致。

检查你的 IDEA 的项目设置的 JDK 是否正确。

使用的 mvn 命令调用的 JDK 是正确的 JDK 版本

使用了正确的 maven 版本，太低的是不行的

<p>如果没有问题的话，你应该可以看到类似输出</p>

<p></p>

<p>都是正常的</p>

<p>这里要说明一下为啥需要把 Docker 的内存设置大点，因为你会发现输出内容中，占用的空间都几个 G 的，如图</p>

<p></p>

<p>当看到 build success 的时候就是成功了</p>

<p></p>

<p>使用 <code>docker images</code> 可以看到刚刚打包好的镜像，让我们启动试试</p>

<p><code>docker run --rm -p 8080:8080 experience:0.0.1-SNAPSHOT</code></p>

<p></p>

<p>0.045, 这启动速度如果是 JVM 真的打不了，到此为止就完成 Spring Native 的简单使用，如果要深入体验还得看看他们的文档 Announcing Spring Native Beta!</p>

<h2 id="6--局限性">6. 局限性</h2>

<p>但是，什么事物都是有两面性的，那么对于 GraalVM 来说，好的一方面就是打包出来的体积更，启动更快，占用的内存更小，让我不禁在想，以前一台 1 核 2G 的服务器部署一个应用就差不多，GraalVM，运行时占用才 50M。那我不就可以部署很多应用？而且性能还这么棒</p>

<p>可惜的是，</p>

GraalVM 在打包的配置要求上挺高，Mac 上没一次打包成功的

对于使用了反射的项目来说，需要在使用 GraalVm 构建 native image 前需要通过配置列出反可见的所有类型

对于 Spring Native 来说，现在任然是测试版，还没有能应用到生产环境的稳定版

<p>但是我感觉这仍然是之后发展的一个趋势，在现在微服务大行其道的局面，Java 也需要一些东来破局。说不定再过一两年，这个成熟稳定之后，我们在树莓派上都能部署起来企业级项目。</p>

<h2 id="7--参考内容">7. 参考内容</h2>

<p>Announcing Spring Native Beta!</p>

<p><a href="https://link.ld246.com/forward?goto=https%3A%2F%2Fdocs.oracle.com%2Fen

2Fgraalvm%2Fenterprise%2F21%2Fdocs%2Foverview%2F" target="_blank" rel="nofollow ugc">Oracle GraalVM Enterprise Edition</p>
<p>使用 graalvm 打包 maven 项目为 exe</p>
<p>如何评价 GraalVM 这个项目？ - kelthuzadx 的回答 - 知乎</p>
<p></p>
<p>GraalVM native-image doesn't compile with Netty</p>
<h2 id="8--改造Solo">8. 改造 Solo</h2>
<p>当发现这个 GraalVM 之后让我挺兴奋的，马上想改造 Solo 博客，这样会让博客在服务器上的用更低，顺便体验一下新玩意儿。可惜的是到现在为止仍然是卡在打包的时候，netty 中大量使用的射的代码，导致打包失败。</p>
<p>然后我想 dubbo 底层不也是使用的 netty 吗，他们都可以打包成功，那我应该也可以，参考了他们的 guideline，给了一点想法，尝试之后仍然不行。</p>
<p>dubbo 项目支持 native image</p>
<p>或许还需要再研究一阵子才能解决这个问题</p>
<p>类似这种配置加了接近一百多行</p>
<p></p>
<p></p>