

# DevOps

## 一、DevOps介绍

软件开发最开始是由两个团队组成：

- 开发计划由 **开发团队** 从头开始设计和整体系统的构建。需要系统不停的迭代更新。
- **运维团队** 将开发团队的Code进行测试后部署上线。希望系统稳定安全运行。

这看似两个目标不同的团队需要协同完成一个软件的开发。

在开发团队指定好计划并完成coding后，需要提供到运维团队。

运维团队向开发团队反馈需要修复的BUG以及一些需要返工的任务。

这时开发团队需要经常等待运维团队的反馈。这无疑延长了事件并推迟了整个软件开发的周期。

会有一种方式，在开发团队等待的时候，让开发团队转移到下一个项目中。等待运维团队为之前的代码提供反馈。

可是这样就意味着一个完整的项目需要一个更长的周期才可以开发出最终代码。

---

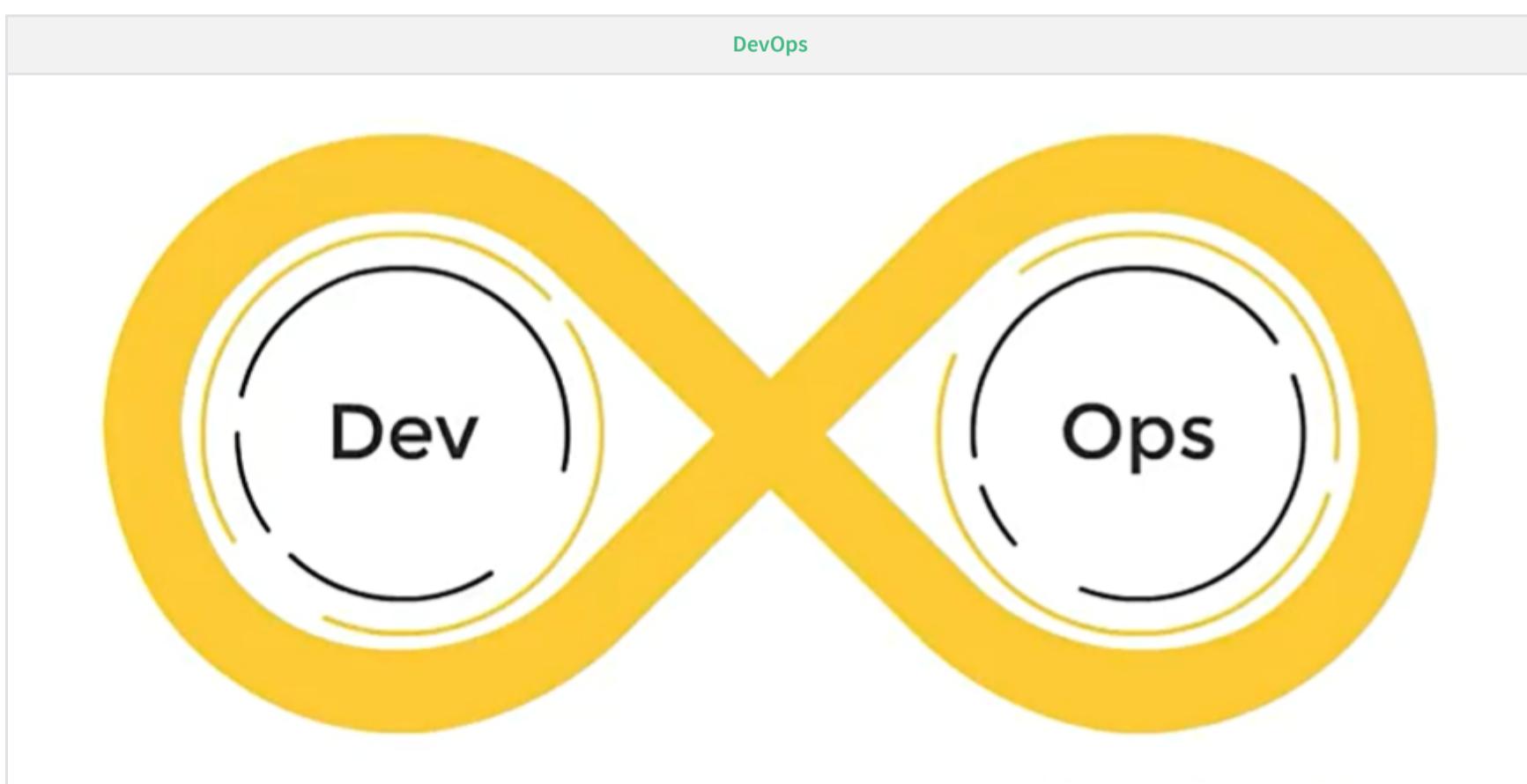
基于现在的互联网现状，更推崇敏捷式开发，这样就导致项目的迭代速度更快，但是由于开发团队与运维团队的沟通问题，会导致新版本上线的时间成本很高。这又违背的敏捷式开发的最初的目的。

那么如果让开发团队和运维团队整合到成一个团队，协同应对一套软件呢？这就被称为 **DevOps**。

**DevOps**，字面意思是Development & Operations的缩写，也就是开发&运维。

虽然字面意思只涉及到了开发团队和运维团队，其实QA测试团队也是参与其中的。

网上可以查看到 **DevOps** 的符号类似于一个无穷大的符号



这表明 **DevOps** 是一个不断提高效率并且持续不断工作的过程

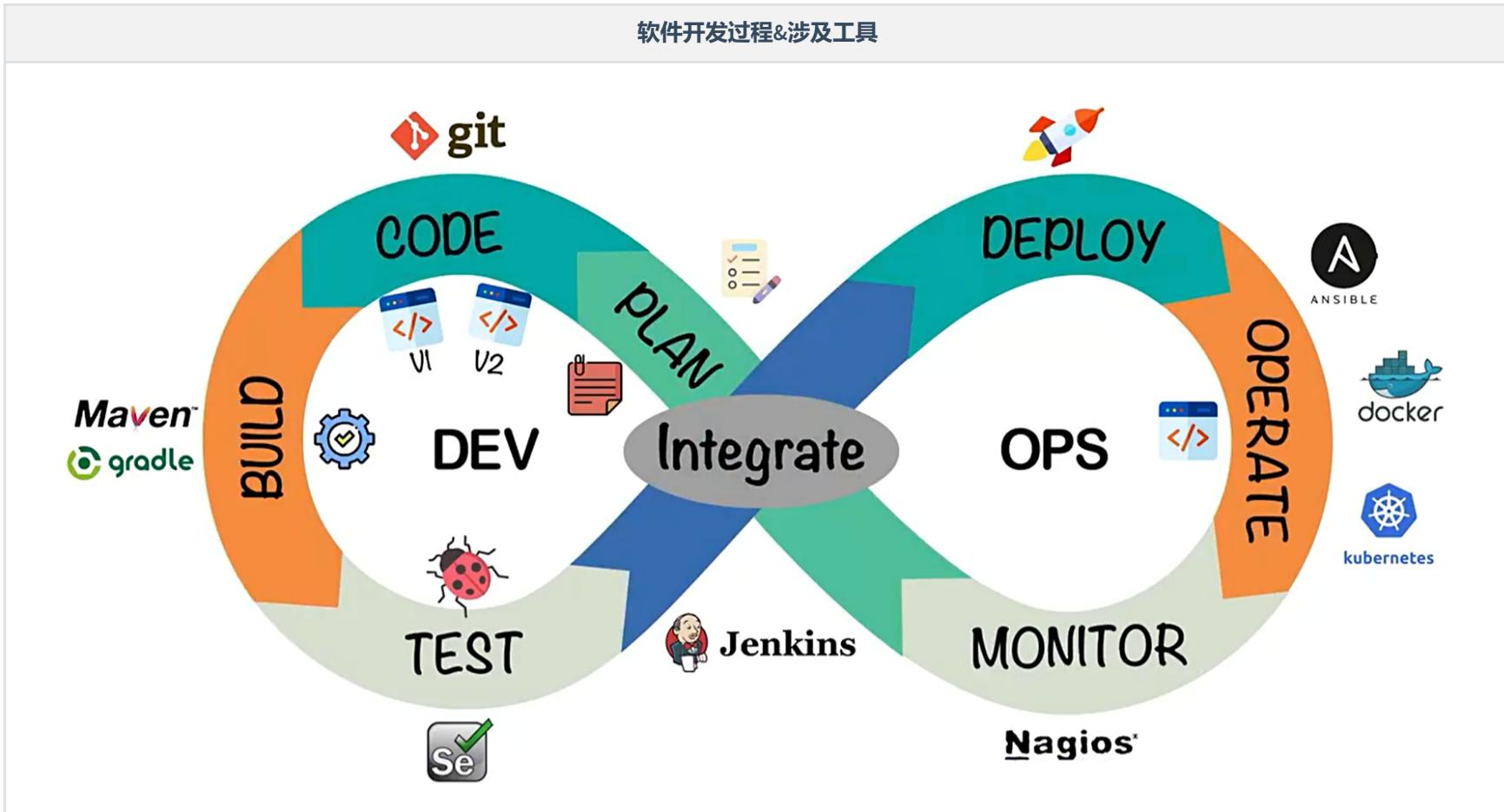
**DevOps** 的方式可以让公司能够更快地应对更新和市场发展变化，开发可以快速交付，部署也更加稳定。

核心就在于 **简化Dev和Ops团队之间的流程，使整体软件开发过程更快速。**

整体的软件开发流程包括：

- PLAN：开发团队根据客户的目标制定开发计划
- CODE：根据PLAN开始编码过程，需要将不同版本的代码存储在一个库中。
- BUILD：编码完成后，需要将代码构建并且运行。
- TEST：成功构建项目后，需要测试代码是否存在BUG或错误。
- DEPLOY：代码经过手动测试和自动化测试后，认定代码已经准备好部署并且交给运维团队。
- OPERATE：运维团队将代码部署到生产环境中。
- MONITOR：项目部署上线后，需要持续的监控产品。
- INTEGRATE：然后将监控阶段收到的反馈发送回PLAN阶段，整体反复的流程就是 **DevOps** 的核心，即持续集成、持续部署。

为了保证整体流程可以高效的完成，各个阶段都有比较常见的工具，如下图：



最终可以给 DevOps 下一个定义： **DevOps 强调的是高效组织团队之间如何通过自动化的工具协作和沟通来完成软件的生命周期管理，从而更快、更频繁地交付更稳定的软件。**

自动化的工具协作和沟通来完成软件的生命周期管理

## 二、Code阶段工具

在code阶段，我们需要将不同版本的代码存储到一个仓库中，常见的版本控制工具就是SVN或者Git，这里我们采用Git作为版本控制工具，GitLab作为远程仓库。

### 2.1 Git安装

<https://git-scm.com/> (傻瓜式安装)

### 2.2 GitLab安装

单独准备服务器，采用Docker安装

- 查看GitLab镜像

```
docker search gitlab
```

- 拉取GitLab镜像

```
docker pull gitlab/gitlab-ce
```

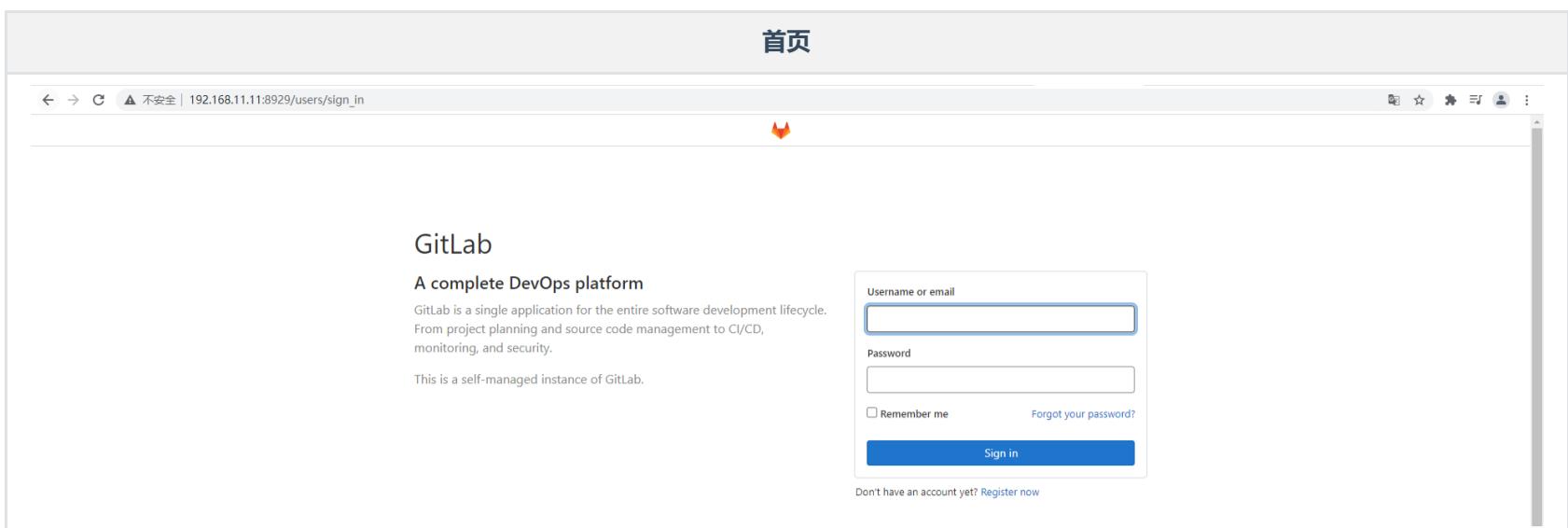
- 准备docker-compose.yml文件

```
version: '3.1'
services:
  gitlab:
    image: 'gitlab/gitlab-ce:latest'
    container_name: gitlab
    restart: always
    environment:
      GITLAB_OMNIBUS_CONFIG: |
        external_url 'http://192.168.11.11:8929'
        gitlab_rails['gitlab_shell_ssh_port'] = 2224
    ports:
      - '8929:8929'
      - '2224:2224'
    volumes:
      - './config:/etc/gitlab'
      - './logs:/var/log/gitlab'
      - './data:/var/opt/gitlab'
```

- 启动容器（需要稍等一小会……）

```
docker-compose up -d
```

- 访问GitLab首页



- 查看root用户初始密码

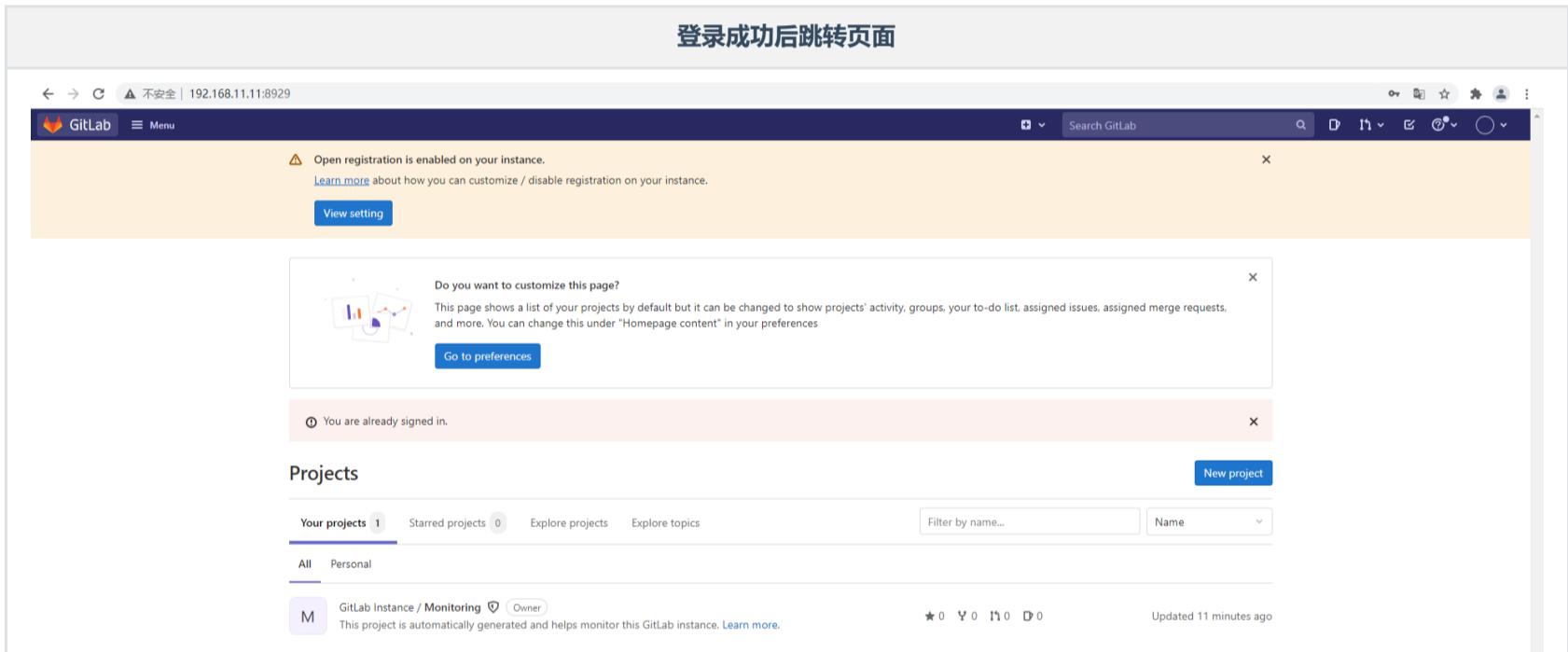
```
docker exec -it gitlab cat /etc/gitlab/initial_root_password
```

```
[root@localhost gitlab_docker]# docker exec -it gitlab cat /etc/gitlab/initial_root_password
# WARNING: This value is valid only in the following conditions
#           1. If provided manually (either via `GITLAB_ROOT_PASSWORD` environment variable or via `gitlab_rails['initial_root_password']` setting in `gitlab.rb`, it was provided before database was seeded for the first time (usually, the first reconfigure run).
#           2. Password hasn't been changed manually, either via UI or via command line.
#
#           If the password shown here doesn't work, you must reset the admin password following https://docs.gitlab.com/ee/security/reset_user_password.html#reset-your-root-password.

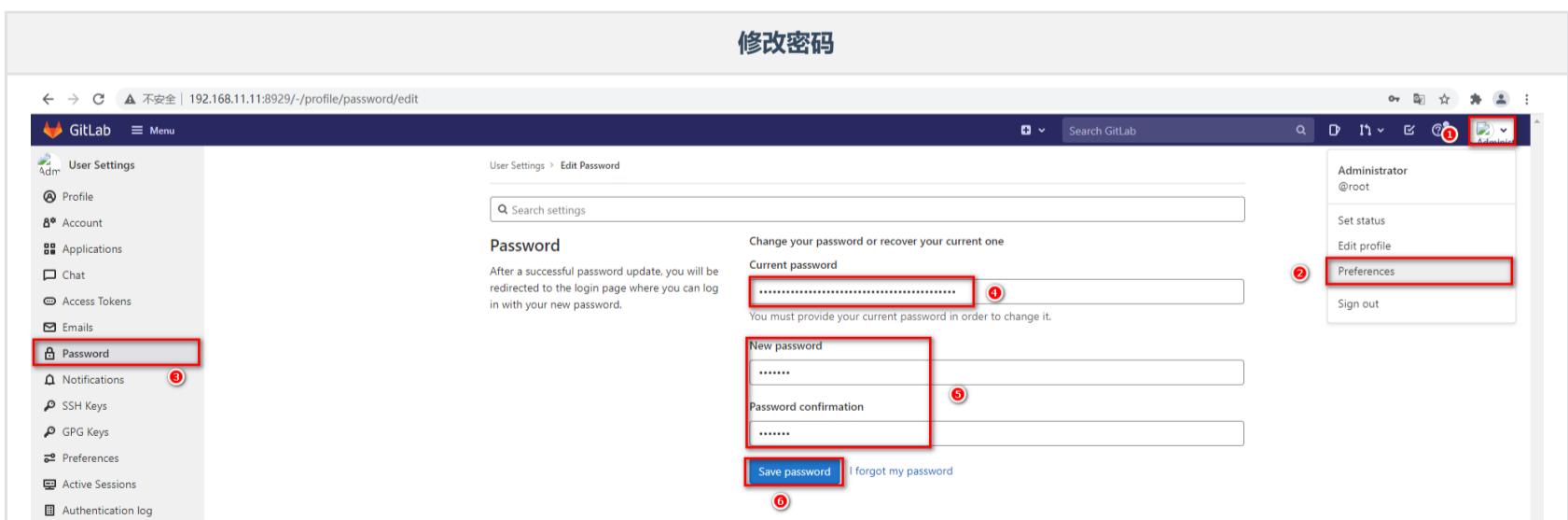
Password: VcJuC1aCGF2hKem7CVSXaW7p7DfmE7vOE8NnbHN60ss=
```

# NOTE: This file will be automatically deleted in the first reconfigure run after 24 hours.

- 登录root用户



- 第一次登录后需要修改密码



搞定后，即可像Gitee、GitHub一样使用。

### 三、Build阶段工具

构建Java项目的工具一般有两种选择，一个是Maven，一个是Gradle。

这里我们选择Maven作为项目的编译工具。

具体安装Maven流程不做阐述，但是需要确保配置好Maven仓库私服以及JDK编译版本。

## 四、Operate阶段工具

部署过程，会采用Docker进行部署，暂时只安装Docker即可，后续还需安装Kubernetes

### 4.1 Docker安装

- 准备测试环境&生产环境
- 下载Docker依赖组件

```
yum -y install yum-utils device-mapper-persistent-data lvm2
```

- 设置下载Docker的镜像源为阿里云

```
yum-config-manager --add-repo http://mirrors.aliyun.com/docker-ce/linux/centos/docker-ce.repo
```

- 安装Docker服务

```
yum -y install docker-ce
```

- 安装成功后，启动Docker并设置开机自启

```
# 启动Docker服务  
systemctl start docker  
# 设置开机自动启动  
systemctl enable docker
```

- 测试安装成功

```
docker version
```

效果

```
[root@localhost gitlab_docker]# docker version  
Client: Docker Engine - Community  
  Version:           20.10.11  
  API version:      1.41  
  Go version:       go1.16.9  
  Git commit:        dea9396  
  Built:             Thu Nov 18 00:38:53 2021  
  OS/Arch:           linux/amd64  
  Context:           default  
  Experimental:     true  
  ...
```

### 4.2 Docker-Compose安装

- 下载Docker/Compose：<https://github.com/docker/compose>
- 将下载好的 `docker-compose-Linux-x86_64` 文件移动到Linux操作系统：.....
- 设置 `docker-compose-Linux-x86_64` 文件权限，并移动到\$PATH目录中

```
# 设置文件权限  
chmod a+x docker-compose-Linux-x86_64  
# 移动到/usr/bin目录下，并重命名为docker-compose  
mv docker-compose-Linux-x86_64 /usr/bin/docker-compose
```

- 测试安装成功

```
docker-compose version
```

效果

```
[root@localhost gitlab_docker]# docker-compose version  
docker-compose version 1.24.1, build 4667896b  
docker-py version: 3.7.3  
CPython version: 3.6.8  
OpenSSL version: OpenSSL 1.1.0j  20 Nov 2018
```

## 五、Integrate工具

持续集成、持续部署的工具很多，其中Jenkins是一个开源的持续集成平台。

Jenkins涉及到将编写完毕的代码发布到测试环境和生产环境的任务，并且还涉及到了构建项目等任务。

Jenkins需要大量的插件保证工作，安装成本较高，下面会基于Docker搭建Jenkins。

### 5.1 Jenkins介绍

Jenkins是一个开源软件项目，是基于Java开发的一种持续集成工具

Jenkins应用广泛，大多数互联网公司都采用Jenkins配合GitLab、Docker、K8s作为实现DevOps的核心工具。

Jenkins最强大的就在于插件，Jenkins官方提供了大量的插件库，来自动化CI/CD过程中的各种琐碎功能。

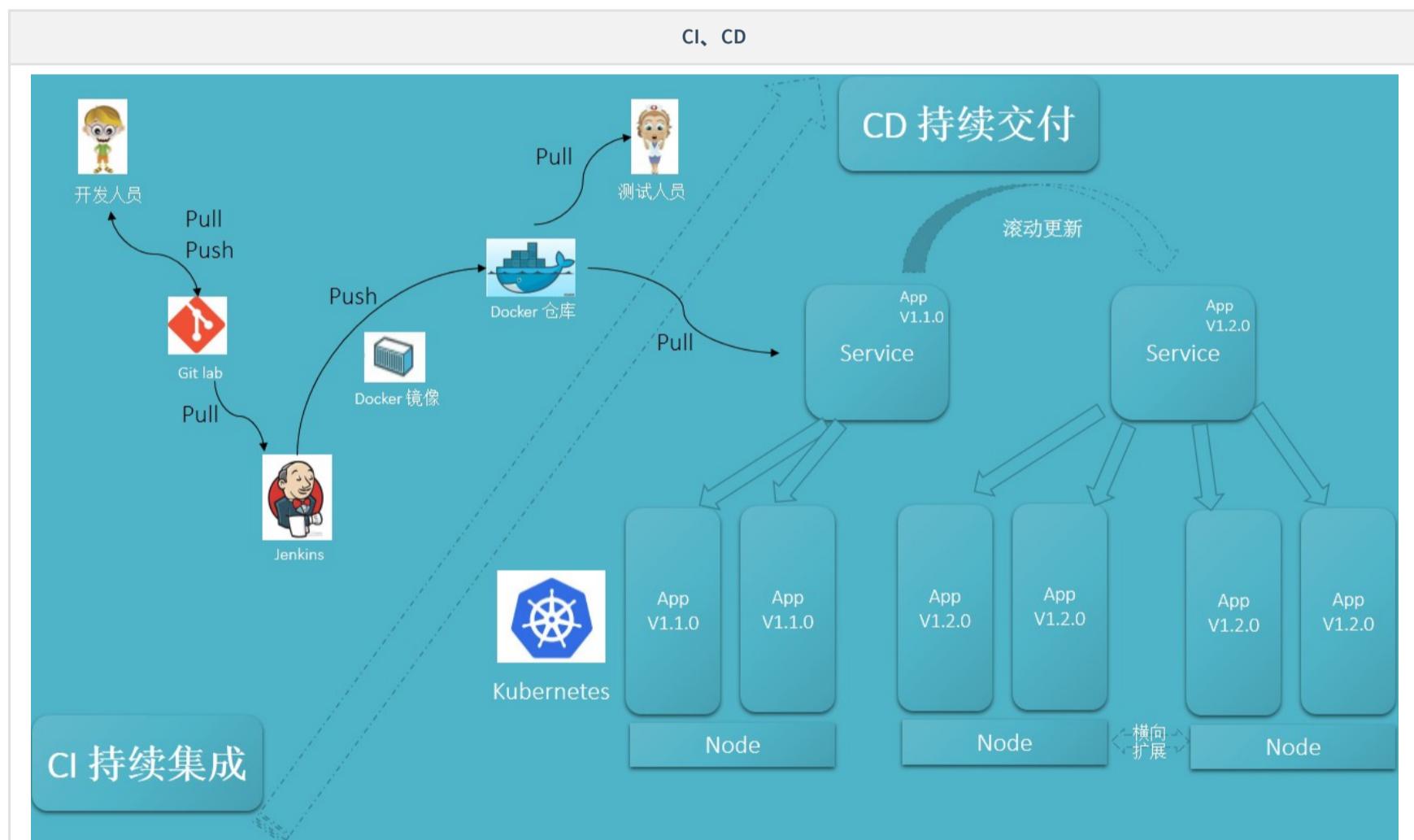


Jenkins最主要的工作就是将GitLab上可以构建的工程代码拉取并且进行构建，再根据流程可以选择发布到测试环境或是生产环境。

一般是GitLab上的代码经过大量的测试后，确定发行版本，再发布到生产环境。

CI/CD可以理解为：

- CI过程即是通过Jenkins将代码拉取、构建、制作镜像交给测试人员测试。
  - 持续集成：让软件代码可以持续的集成到主干上，并自动构建和测试。
- CD过程即是通过Jenkins将打好标签的发行版本代码拉取、构建、制作镜像交给运维人员部署。
  - 持续交付：让经过持续集成的代码可以进行手动部署。
  - 持续部署：让可以持续交付的代码随时随地的自动化部署。



## 5.2 Jenkins安装

- 拉取Jenkins镜像

```
docker pull jenkins/jenkins
```

- 编写docker-compose.yml

```
version: "3.1"
services:
  jenkins:
    image: jenkins/jenkins
    container_name: jenkins
    ports:
      - 8080:8080
      - 50000:50000
    volumes:
      - ./data/:/var/jenkins_home/
```

- 首次启动会因为数据卷data目录没有权限导致启动失败，设置data目录写权限

**错误日志**

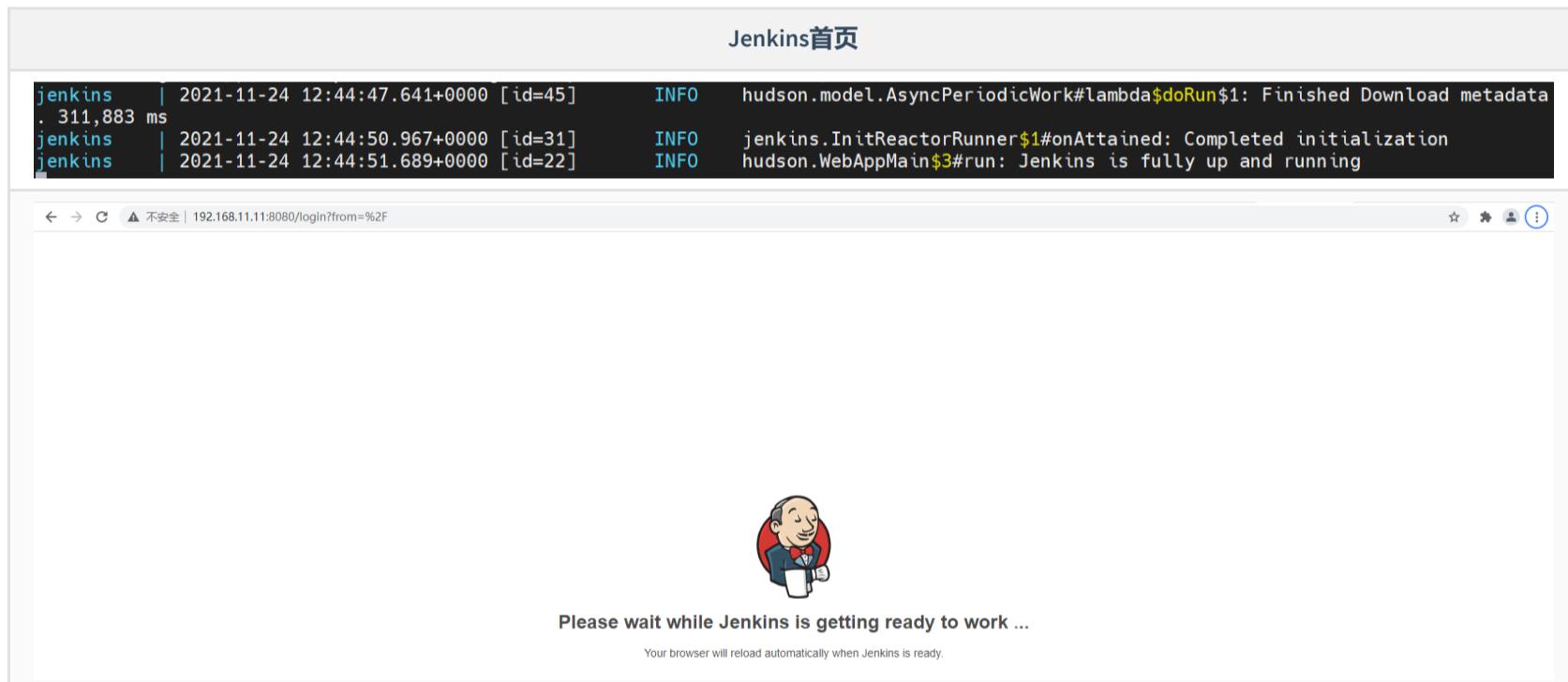
```
[root@localhost jenkins_docker]# docker-compose logs -f
Attaching to jenkins
jenkins    | touch: cannot touch '/var/jenkins_home/copy_reference_file.log': Permission denied
jenkins    | Can not write to /var/jenkins_home/copy_reference_file.log. Wrong volume permissions?
jenkins exited with code 1
```

```
chmod -R a+w data/
```

- 重新启动Jenkins容器后，由于Jenkins需要下载大量内容，但是由于默认下载地址下载速度较慢，需要重新设置下载地址为国内镜像站

```
# 修改数据卷中的hudson.model.UpdateCenter.xml文件
<?xml version='1.1' encoding='UTF-8'?>
<sites>
  <site>
    <id>default</id>
    <url>https://updates.jenkins.io/update-center.json</url>
  </site>
</sites>
# 将下载地址替换为http://mirror.esuni.jp/jenkins/updates/update-center.json
<?xml version='1.1' encoding='UTF-8'?>
<sites>
  <site>
    <id>default</id>
    <url>http://mirror.esuni.jp/jenkins/updates/update-center.json</url>
  </site>
</sites>
# 清华大学的插件源也可以https://mirrors.tuna.tsinghua.edu.cn/jenkins/updates/update-center.json
```

- 再次重启Jenkins容器，访问Jenkins（需要稍微等会）



- 查看密码登录Jenkins，并登录下载插件

```
docker exec -it jenkins cat /var/jenkins_home/secrets/initialAdminPassword
```

登录并下载插件

入门

## 解锁 Jenkins

为了确保管理员安全地安装 Jenkins，密码已写入到日志中（[不知道在哪里？](#)）该文件在服务器上：

`/var/jenkins_home/secrets/initialAdminPassword`

请从本地复制密码并粘贴到下面。

管理员密码  
.....|

继续

新手入门

## 自定义 Jenkins

插件通过附加特性来扩展 Jenkins 以满足不同的需求。

**安装推荐的插件**  
安装 Jenkins 社区推荐的插件。

**选择插件来安装**  
选择并安装最适合的插件。

The image shows two screenshots of the Jenkins setup wizard. The top screenshot is titled 'Unlock Jenkins' and displays instructions for finding the initial admin password in the logs. It includes a text input field for the password and a 'Continue' button. The bottom screenshot is titled 'Customize Jenkins' and shows two options: 'Install recommended plugins' (light blue box) and 'Select plugins to install' (grey box with a red border). A red arrow points from the text '选择需要安装的插件' (Select the plugins to install) to the 'Select plugins to install' box.

- 选择需要安装的插件

**选择需要安装的插件**

The screenshots show the Jenkins plugin manager interface with three tabs selected:

- Git** (highlighted in the first screenshot)
- publish** (highlighted in the second screenshot)
- 全部 | 无 | 建议** (highlighted in the third screenshot)

In the first screenshot, the "Git Parameter" plugin is selected and highlighted with a red box.

In the second screenshot, the "Publish Over SSH" plugin is selected and highlighted with a red box.

In the third screenshot, the "Folders", "OWASP Markup Formatter", "Build Timeout", and "Credentials Binding" plugins are selected, while "Publish Over SSH" is shown as a dependency under "SSH server".

- 下载完毕设置信息进入首页（可能会出现下载失败的插件）

### 5.3 Jenkins入门配置

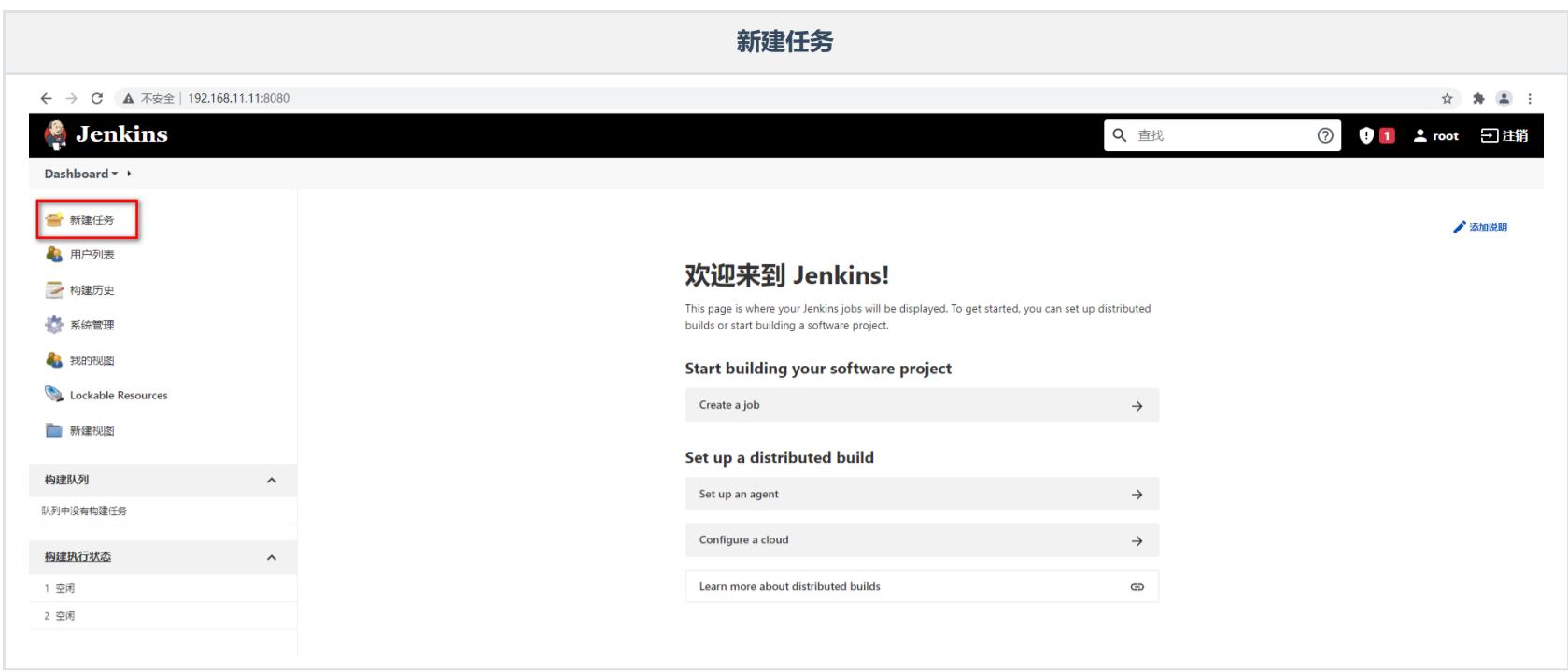
由于Jenkins需要从Git拉取代码、需要本地构建、甚至需要直接发布自定义镜像到Docker仓库，所以Jenkins需要配置大量内容。

#### 5.3.1 构建任务

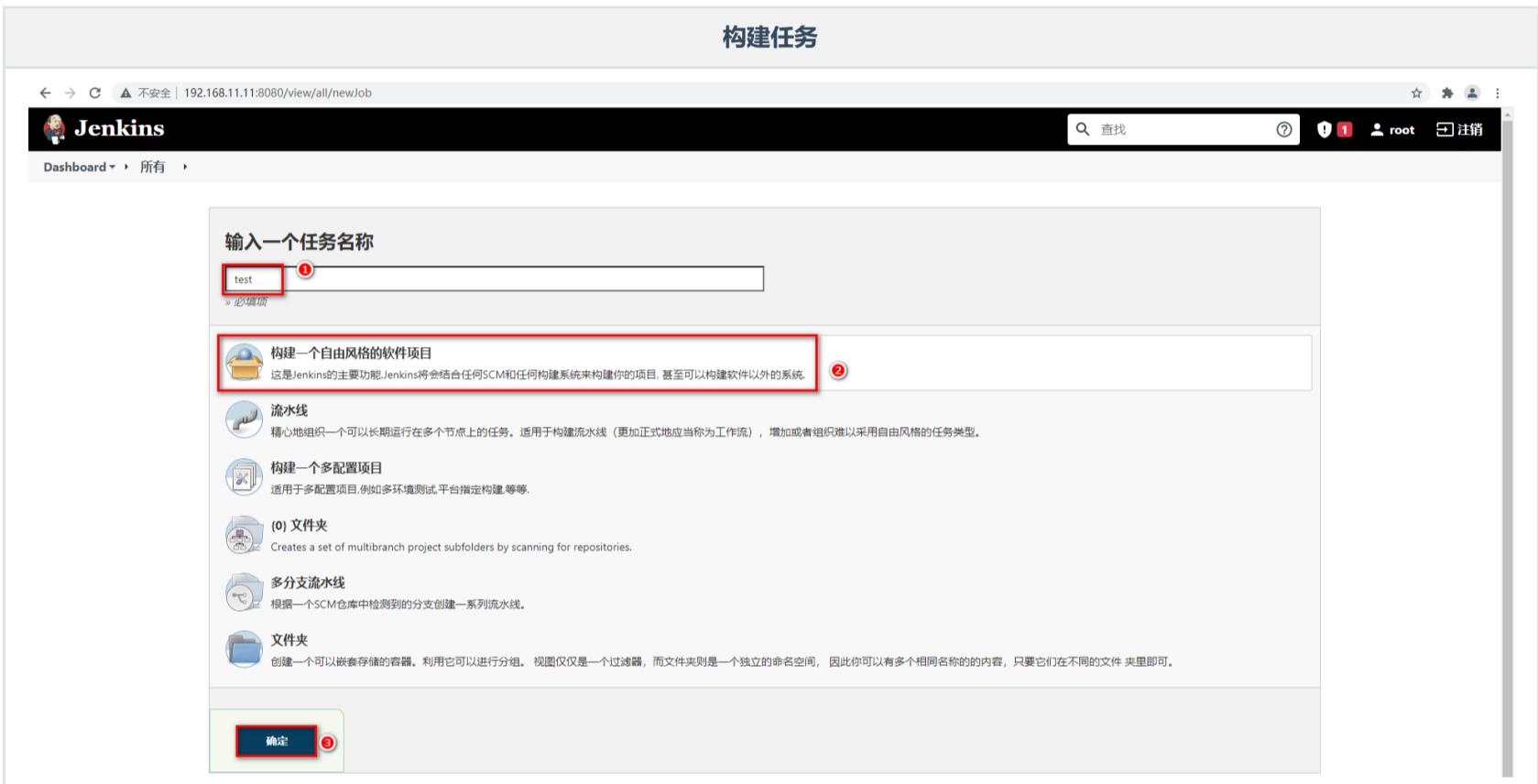
准备好GitLab仓库中的项目，并且通过Jenkins配置项目的实现当前项目的DevOps基本流程。

- 构建Maven工程发布到GitLab（Gitee、Github均可）

- Jenkins点击左侧导航新建任务



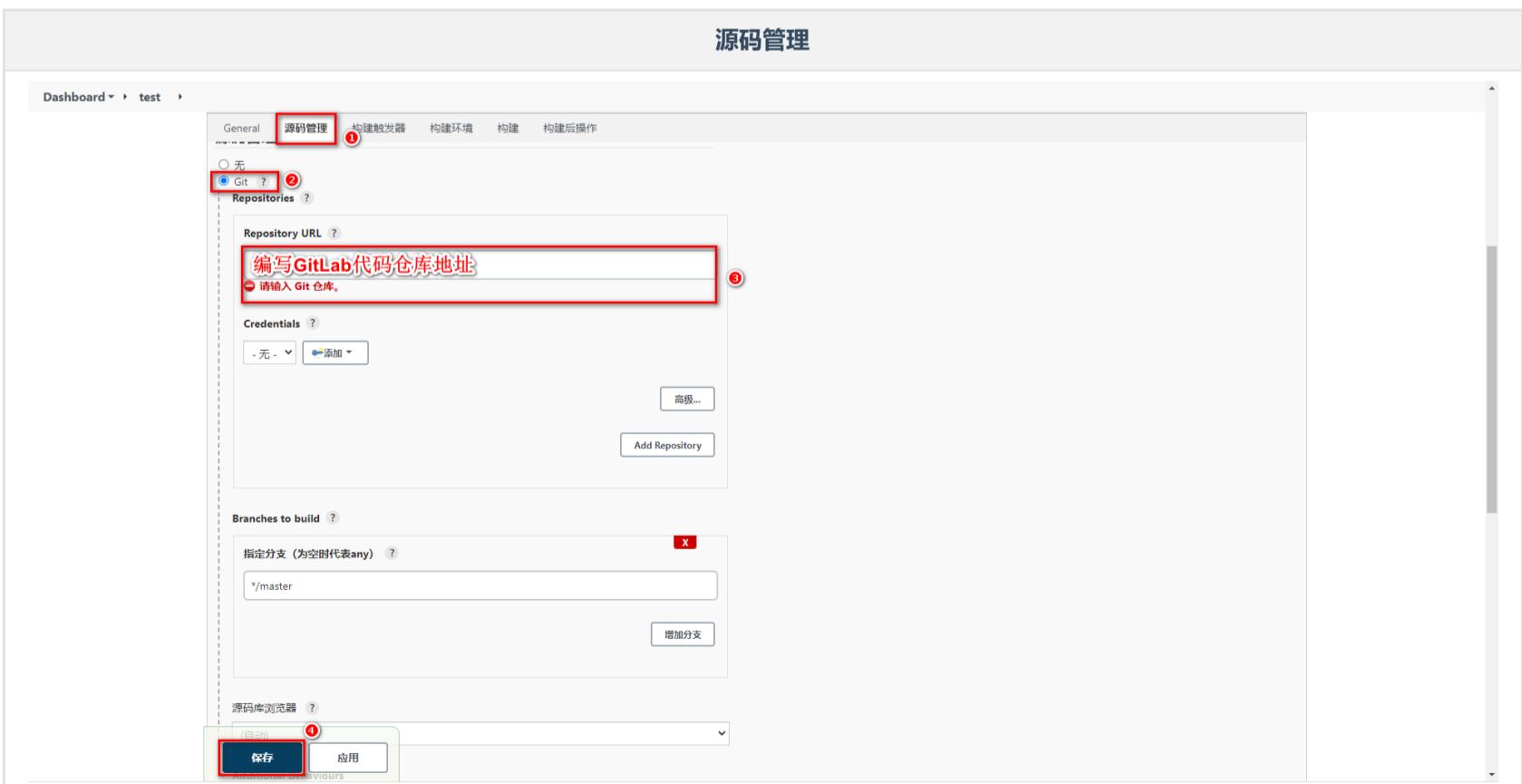
- 选择自由风格构建任务



### 5.3.1 配置源码拉取地址

Jenkins需要将Git上存放的源码存储到Jenkins服务所在磁盘的本地

- 配置任务源码拉取的地址



- Jenkins立即构建

点击任务test中的立即构建

- 查看构建工程的日志，点击上述③的任务条即可

查看任务拉取Git源码日志

可以看到源码已经拉取到Jenkins本地，可以根据第三行日志信息，查看Jenkins本地拉取到的源码。

- 查看Jenkins容器中`/var/jenkins_home/workspace/test`的源码

源码存放位置

```
[root@localhost gitlab_docker]# docker exec -it jenkins bash
jenkins@c97eec8bdf42:/$ cd /var/jenkins_home/workspace/test
jenkins@c97eec8bdf42:~/workspace/test$ ls
pom.xml  src
jenkins@c97eec8bdf42:~/workspace/test$
```

### 5.3.2 配置Maven构建代码

代码拉取到Jenkins本地后，需要在Jenkins中对代码进行构建，这里需要Maven的环境，而Maven需要Java的环境，接下来需要在Jenkins中安装JDK和Maven，并且配置到Jenkins服务。

- 准备JDK、Maven压缩包通过数据卷映射到Jenkins容器内部

数据卷存放位置

```
[root@localhost jenkins_docker]# ls
data  docker-compose.yml
[root@localhost jenkins_docker]# ls data/
apache-maven-3.6.1-bin.tar.gz  jdk-8u231-linux-x64.tar.gz  jobs          queue.xml.bak    users
config.xml                   jenkins.install.InstallUtil.installPlugins  logs          secret.key      war
copy_reference_file.log       jenkins.install.InstallUtil.lastExecVersion  nodeMonitors.xml  secret.key.not-so-secret workflow-libs
hudson.model.UpdateCenter.xml jenkins.install.UpgradeWizard.state   nodes          secrets        workspace
hudson.plugins.git.GitTool.xml jenkins.model.JenkinsLocationConfiguration.xml plugins        updates
identity.key.enc             jenkins.telemetry.Correlator.xml    queue.xml      userContent
```

- 解压压缩包，并配置Maven的settings.xml

```
<!-- 阿里云镜像地址 -->
<mirror>
  <id>alimaven</id>
  <name>aliyun maven</name>
  <url>http://maven.aliyun.com/nexus/content/groups/public/</url>
  <mirrorOf>central</mirrorOf>
</mirror>
<!-- JDK1.8编译插件 -->
<profile>
  <id>jdk-1.8</id>
  <activation>
    <activeByDefault>true</activeByDefault>
    <jdk>1.8</jdk>
```

```

</activation>
<properties>
    <maven.compiler.source>1.8</maven.compiler.source>
    <maven.compiler.target>1.8</maven.compiler.target>
    <maven.compiler.compilerVersion>1.8</maven.compiler.compilerVersion>
</properties>
</profile>

```

- Jenkins配置JDK&Maven并保存

The screenshot shows two configuration pages for Jenkins global tools:

- JDK Configuration:** A red box highlights the "JDK" section. It includes fields for "JDK 别名" (alias) set to "jdk" and "JAVA\_HOME" set to "/var/jenkins\_home/jdk". There is also a checkbox for "自动安装" (auto-install). A "继续 JDK" (Continue JDK) button is at the bottom.
- Maven Configuration:** A red box highlights the "Maven" section. It includes fields for "Maven Name" set to "maven" and "MAVEN\_HOME" set to "/var/jenkins\_home/maven". There is also a checkbox for "自动安装" (auto-install). A "继续 Maven" (Continue Maven) button is at the bottom.

- 配置Jenkins任务构建代码

The screenshot shows the Jenkins job configuration interface for a job named "test".

**左侧导航栏:** 包含 "返回面板", "状态", "修改记录", "工作空间", "立即构建", "配置" (highlighted with a red box), "删除工程" 和 "重命名"。

**右侧主区域:**

- 工程 test:** 显示 "工作区" 和 "最新修改记录"。
- 相关链接:** 列出最近一次构建和最近稳定构建的时间。
- 构建步骤:** 显示 "General", "源码管理", "构建触发器", "构建环境", "构建" (highlighted with a red box) 和 "构建后操作"。构建步骤中，"构建" 部分被一个大红框包围，包含 "调用顶层 Maven 目标" (highlighted with a red box)、"Maven 版本" (set to "maven") 和 "目标" (set to "package")。
- 底部按钮:** 包含 "保存" 和 "应用" 按钮。

- 立即构建测试，查看target下的jar包

构建源码

The screenshot shows the Jenkins build log for job #4. The '控制台输出' (Console Output) tab is selected and highlighted with a red box. The log output shows the Maven build process, including dependency download from alimaven and the creation of a target directory containing the generated jar file.

```

控制台输出
Started by user root
Running as SYSTEM
Building in workspace /var/jenkins_home/workspace/test
The recommended git tool is: NONE
No credentials specified
> git rev-parse --resolve-git-dir /var/jenkins_home/workspace/test/.git # timeout=10
Fetching changes from the remote Git repository
> git config remote.origin.url http://49.233.115.171:8929/root/test.git # timeout=10
Fetching upstream changes from http://49.233.115.171:8929/root/test.git
> git --version # timeout=10
> git --version # 'git version 2.30.2'
> git fetch --tags --force --progress -- http://49.233.115.171:8929/root/test.git +refs/heads/*:refs/remotes/origin/* # timeout=10
> git rev-parse refs/remotes/origin/master^{commit} # timeout=10
Checking out Revision 2ba67af3a8e8b5225e3c9bc1e581489fb32d47f (refs/remotes/origin/master)
> git config core.sparsecheckout # timeout=10
> git checkout -f 2ba67af3a8e8b5225e3c9bc1e581489fb32d47f # timeout=10
Commit message: "SpringBoot工程"
> git rev-list --no-walk 2ba67af3a8e8b5225e3c9bc1e581489fb32d47f # timeout=10
[test] $ [var/jenkins_home/maven/bin/mvn package] ②
[INFO] Scanning for projects...
Downloading from alimaven: http://maven.aliyun.com/nexus/content/groups/public/org/springframework/boot/spring-boot-starter-parent/2.1.6.RELEASE/spring-boot-starter-parent-2.1.6.RELEASE.pom
Progress (): 2.3/123 kB
Progress (): 5.1/123 kB
Progress (): 7.9/123 kB
Progress (): 11/123 kB
Progress (): 14/123 kB
Progress (): 16/123 kB
Progress (): 19/123 kB
Progress (): 22/123 kB
Progress (): 25/123 kB
Progress (): 28/123 kB
Progress (): 30/123 kB
Progress (): 32/123 kB
Progress (): 34/123 kB
Progress (): 36/123 kB
Progress (): 38/123 kB
Progress (): 40/123 kB
Progress (): 42/123 kB
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Progress (): 80/123 kB
Progress (): 82/123 kB
Progress (): 84/123 kB
Progress (): 86/123 kB
Progress (): 88/123 kB
Progress (): 90/123 kB
Progress (): 92/123 kB
Progress (): 94/123 kB
Progress (): 96/123 kB
Progress (): 98/123 kB
Progress (): 100/123 kB
[root@localhost test]# ls
pom.xml  src
[root@localhost test]# ls
pom.xml  src  target
[root@localhost test]# ls target
classes          demo-0.0.1-SNAPSHOT.jar.original  generated-test-sources  maven-status
demo-0.0.1-SNAPSHOT.jar  generated-sources      maven-archiver        test-classes
[root@localhost test]#

```

### 5.3.3 配置Publish发布&远程操作

jar包构建好之后，就可以根据情况发布到测试或生产环境，这里需要用到之前下载好的插件Publish Over SSH。

- 配置Publish Over SSH连接测试、生产环境

Publish Over SSH配置

The screenshot shows the 'SSH Servers' configuration page. It includes fields for '目标服务别名' (Target Service Alias), 'ip地址' (IP Address), '用户名' (Username), and '目标服务指定目录' (Target Service Specified Directory). It also includes sections for password authentication and key-based authentication.

- 配置任务的构建后操作，发布jar包到目标服务

配置构建后操作

The screenshot shows the Jenkins configuration interface for the 'test' project. The left sidebar includes links for '返回面板', '状态', '修改记录', '工作空间', '立即构建', '配置' (which is highlighted with a red box), '删除工程', and '重命名'. The main content area has a title '工程 test' and a '相关链接' section with two items: '最近一次构建(#3,33 分之前)' and '最近稳定构建(#3,33 分之前)'. Below this is a 'Dashboard > test >' breadcrumb. The configuration tabs include General, 源码管理, 构建触发器, 构建环境, 构建, and 构建后操作 (which is selected and highlighted with a red box). The '构建后操作' tab contains several options, with 'Send build artifacts over SSH' being highlighted with a red box and circled with a red number '①'. A '增加构建后操作步骤' button is also highlighted with a red box and circled with a red number '②'. At the bottom are '保存' and '应用' buttons.

This screenshot shows the 'Send build artifacts over SSH' configuration screen under the '构建后操作' tab. It includes sections for 'SSH Publishers' (with 'Name' set to 'testEnvironment') and 'Transfers' (with 'Source files' set to 'target/\*.jar'). A red box highlights the '选择发布的文件' text next to the source file path. A red annotation '指定配置好的目标服务' points to the 'Name' field in the 'SSH Publishers' section.

- 立即构建任务，并去目标服务查看

立即构建

**控制台输出**

```

Started by user root
Running as SYSTEM
Building in workspace /var/jenkins_home/workspace/test
The recommended git tool is: NONE
No credentials specified
> git rev-parse --resolve-git-dir /var/jenkins_home/workspace/test/.git # timeout=10
Fetching changes from the remote Git repository
> git config remote.origin.url http://49.233.115.171:8929/root/test.git # timeout=10
Fetching upstream changes from http://49.233.115.171:8929/root/test.git
> git --version # timeout=10
> git fetch --tags --force --progress -- http://49.233.115.171:8929/root/test.git +refs/heads/*:refs/remotes/origin/*
> git rev-parse refs/remotes/origin/master^{commit} # timeout=10
Checking out Revision 2ba6f7af3a9e0b5225e3c9bce1e581489fb32d47f (refs/remotes/origin/master)
> git config core.sparsecheckout # timeout=10
> git checkout -f 2ba6f7af3a9e0b5225e3c9bce1e581489fb32d47f # timeout=10
Commit message: "SpringBoot工具"
> git rev-list --no-walk 2ba6f7af3a9e0b5225e3c9bce1e581489fb32d47f # timeout=10
[test] $ /var/jenkins_home/maven/bin/mvn package

```

省略部分日志。• • •

```

SSH: Connecting from host [c97ee0bdf42]
SSH: Connecting with configuration [testEnvironment] ...
SSH: Disconnecting configuration [testEnvironment] ...
SSH: Transferred 1 file(s)
Finished: SUCCESS

```

```

[root@localhost test]# ls
target
[root@localhost test]# ls target/
demo-0.0.1-SNAPSHOT.jar
[root@localhost test]#

```

## 六、CI、CD入门操作

基于Jenkins拉取GitLab的SpringBoot代码进行构建发布到测试环境实现持续集成

基于Jenkins拉取GitLab指定发行版本的SpringBoot代码进行构建发布到生产环境实现CD实现持续部署

### 6.1 持续集成

为了让程序代码可以自动推送到测试环境基于Docker服务运行，需要添加Docker配置和脚本文件让程序可以在集成到主干的同时运行起来。

- 添加Dockerfile文件

构建自定义镜像

```

FROM adoptopenjdk/openjdk8
COPY demo.jar /usr/local/
WORKDIR /usr/local/
CMD java -jar demo.jar

```

- 添加docker-compose.yml文件

加载自定义镜像启动容器

```

version: '3.1'
services:
  demo:
    build: .
    image: demo:v1.0.0
    container_name: demo
    ports:
      - 8888:8080

```

- 追加Jenkins构建后操作脚本命令

**构建后发布并执行脚本命令**

- 发布到GitLab后由Jenkins立即构建并托送到目标服务器

**构建日志**

- 测试部署到目标服务器程序

**查看目标服务器并测试接口**

```
[root@localhost docker]# pwd
/usr/local/test/docker
[root@localhost docker]# ls
demo.jar docker-compose.yml Dockerfile
[root@localhost docker]# docker ps
CONTAINER ID        IMAGE             COMMAND            CREATED           STATUS            PORTS
f8566df8f7c0        demo:v1.0.0      "/bin/sh -c 'java -m..."   13 seconds ago   Up 12 seconds   0.0.0.0:8888->8080/tcp, :::8888->8080/tcp
```

192.168.11.11:8888/test  
Hello World!

## 6.2 持续交付、部署

程序代码在经过多次集成操作到达最终可以交付，持续交付整体流程和持续集成类似，不过需要选取指定的发行版本

- 下载Git Parameter插件

**下载Git Parameter**

Git Parameter Plug-In  
Adds ability to choose branches, tags or revisions from git repositories configured in project.

- 设置项目参数化构建

## 基于Git标签构建

The screenshot shows the Jenkins General configuration page for a project named 'test'. The 'General' tab is selected. A red box highlights the '参数化构建过程?' checkbox, which is checked. Another red box highlights the 'Git 参数' section, and a third red box highlights the '名称?' field where 'release' is entered. A note above the field says '作为标识, 不要带有v'.

- 给项目添加tag版本

The screenshot shows the GitLab 'New Tag' creation interface. The 'Tags' menu item in the sidebar is highlighted with a red box. The main form has 'Tag name' set to 'v1.0.0' (highlighted with a red box), 'Create from' set to 'master', and a message 'v1.0.0发行版本'. Below the message is a 'Release notes' section with a rich text editor. At the bottom is a 'Create tag' button (highlighted with a red box).

- 任务构建时，采用Shell方式构建，拉取指定tag版本代码



- 基于Parameter构建任务，任务发布到目标服务器

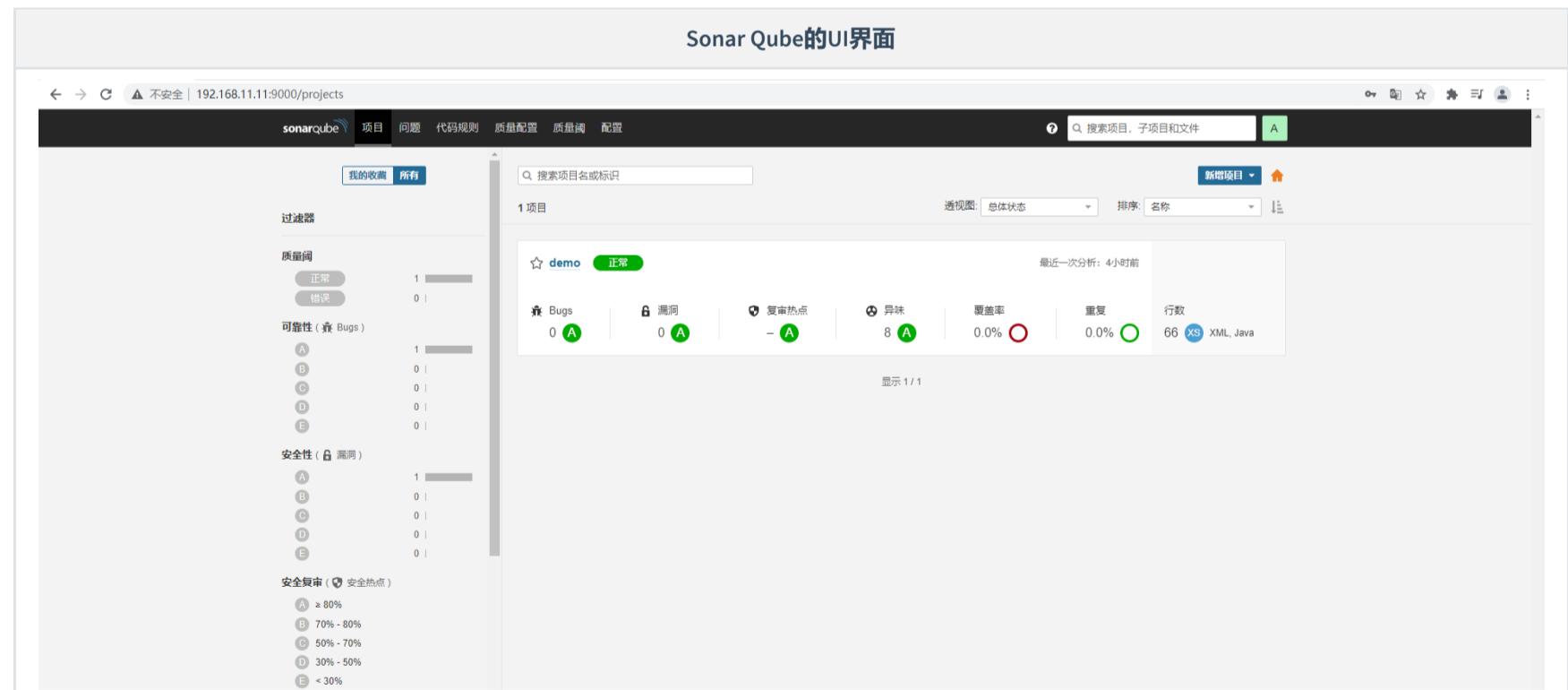


## 七、集成Sonar Qube

### 7.1 Sonar Qube介绍

Sonar Qube是一个开源的代码分析平台，支持Java、Python、PHP、JavaScript、CSS等25种以上的语言，可以检测出重复代码、代码漏洞、代码规范和安全性漏洞的问题。

Sonar Qube可以与多种软件整合进行代码扫描，比如Maven，Gradle，Git，Jenkins等，并且会将代码检测结果推送给Sonar Qube并且在系统提供的UI界面上显示出来



### 7.2 Sonar Qube环境搭建

#### 7.2.1 Sonar Qube安装

Sonar Qube在7.9版本中已经放弃了对MySQL的支持，并且建议在商业环境中采用PostgreSQL，那么安装Sonar Qube时需要依赖PostgreSQL。

并且这里会安装Sonar Qube的长期支持版本 8.9

- 拉取镜像

```
docker pull postgres
docker pull sonarqube:8.9.3-community
```

- 编写docker-compose.yml

```

version: "3.1"
services:
  db:
    image: postgres
    container_name: db
    ports:
      - 5432:5432
    networks:
      - sonarnet
    environment:
      POSTGRES_USER: sonar
      POSTGRES_PASSWORD: sonar
  sonarqube:
    image: sonarqube:8.9.3-community
    container_name: sonarqube
    depends_on:
      - db
    ports:
      - "9000:9000"
    networks:
      - sonarnet
    environment:
      SONAR_JDBC_URL: jdbc:postgresql://db:5432/sonar
      SONAR_JDBC_USERNAME: sonar
      SONAR_JDBC_PASSWORD: sonar
networks:
  sonarnet:
    driver: bridge

```

- 启动容器

```
docker-compose up -d
```

- 需要设置sysctl.conf文件信息

设置vm.max\_map\_count

```

ERROR: [1] bootstrap checks failed. You must address the points described in the following [1] lines before starting Elasticsearch.
bootstrap check failure [1] of [1]: max virtual memory areas vm.max_map_count [65530] is too low, increase to at least [262144]
ERROR: Elasticsearch did not exit normally - check the logs at /opt/sonarqube/logs/sonarqube.log

[root@localhost sonarQube_docker]# vi /etc/sysctl.conf
# sysctl settings are defined through files in
# /usr/lib/sysctl.d/, /run/sysctl.d/, and /etc/sysctl.d/.
#
# Vendors settings live in /usr/lib/sysctl.d/.
# To override a whole file, create a new file with the same in
# /etc/sysctl.d/ and put new settings there. To override
# only specific settings, add a file with a lexically later
# name in /etc/sysctl.d/ and put new settings there.
#
# For more information, see sysctl.conf(5) and sysctl.d(5).
vm.max_map_count=262144
~
```

并执行命令刷新

```
sysctl -p
```

- 重新启动需要一定时间启动，可以查看容器日志，看到如下内容代表启动成功

容器日志

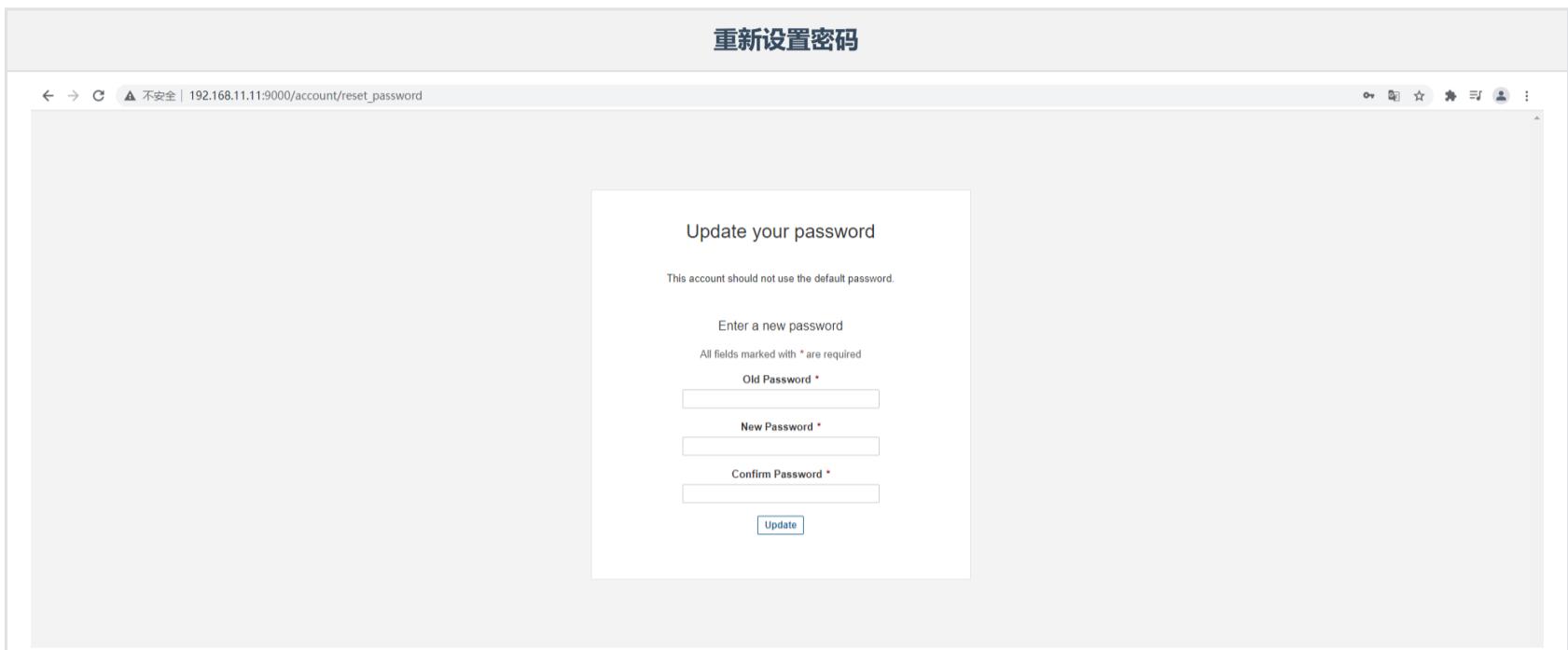
```

ce[][o.s.p.ProcessEntryPoint] Starting ce
ce[][o.s.ce.app.CeServer] Compute Engine starting up...
ce[][o.s.s.e.EsClientProvider] Connected to local Elasticsearch: [http://localhost:9001]
ce[][o.sonar.db.Database] Create JDBC data source for jdbc:postgresql://db:5432/sonar
ce[][o.s.s.p.ServerFileSystemImpl] SonarQube home: /opt/sonarqube
ce[][o.s.c.c.CePluginRepository] Load plugins
ce[][o.s.c.c.ComputeEngineContainerImpl] Running Community edition
ce[][o.s.ce.app.CeServer] Compute Engine is operational
app[][o.s.a.SchedulerImpl] Process[ce] is up
app[][o.s.a.SchedulerImpl] SonarQube is up
```

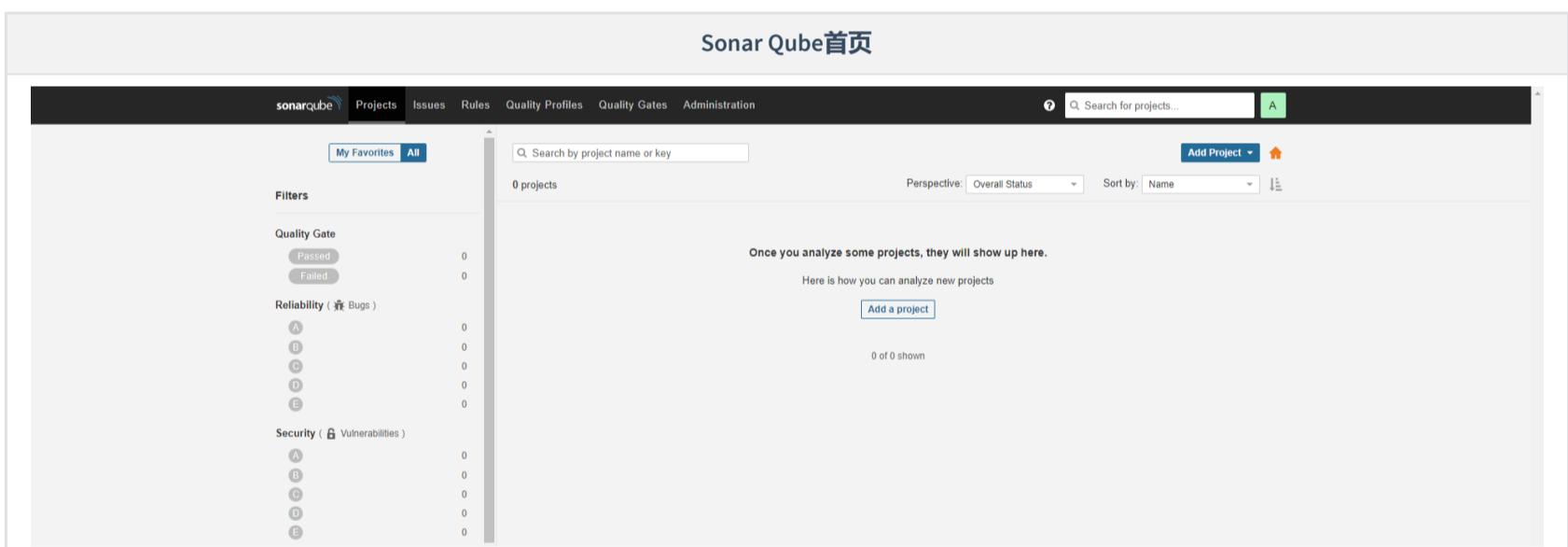
- 访问Sonar Qube首页



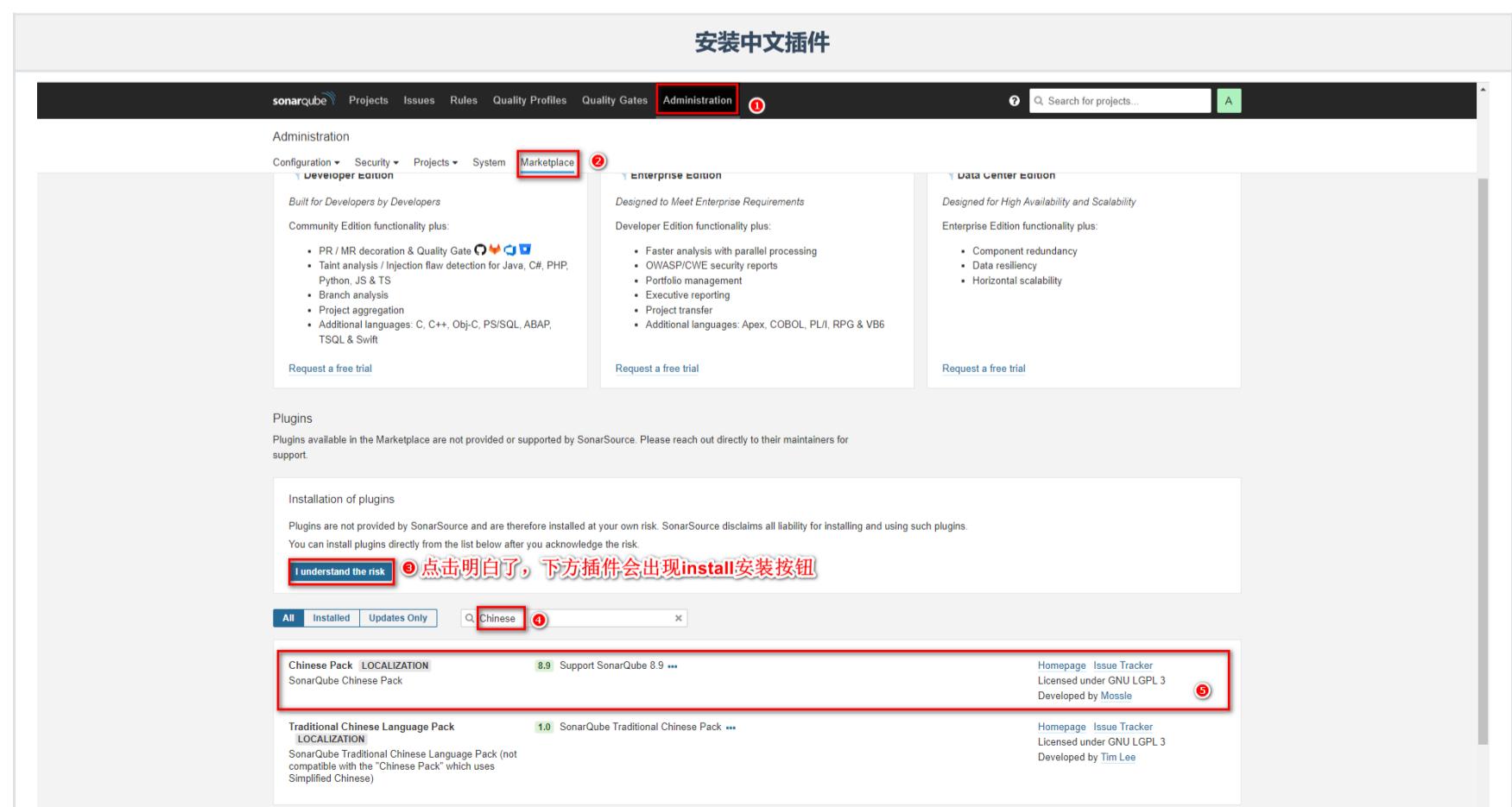
- 还需要重新设置一次密码



- Sonar Qube首页



## 7.2.2 安装中文插件



安装成功后需要重启，安装失败重新点击install重装即可。

安装成功后，会查看到重启按钮，点击即可

**重启按钮**

The screenshot shows the SonarQube administration interface for the Marketplace. A prominent message at the top states: "SonarQube needs to be restarted in order to install 1 plugins". Below this, a red box highlights the "Restart Server" button. The page also displays three editions of SonarQube: Developer Edition, Enterprise Edition, and Data Center Edition, each with a "Request a free trial" link. Below these sections, there is a "Plugins" section with a search bar and a list of available plugins, including "Chinese Pack" and "Traditional Chinese Language Pack".

重启后查看效果

**首页效果**

The screenshot shows the SonarQube project dashboard. On the left, there is a sidebar with filters for "我的收藏" and "所有" projects. The main area displays various quality metrics: "质量问题" (0 errors, 0 critical), "可靠性 (Bug)" (0 bugs for levels A, B, C, D, E), "安全性 (漏洞)" (0 vulnerabilities for levels A, B, C, D, E), and "安全复审 (安全热点)" (0 hotspots for levels A, B, C, D, E). At the top right, there is a search bar and a "新增项目" button. The center of the screen shows a message: "分析过的项目会显示在这里。如何分析新项目" and a "创建新项目" button.

## 7.3 Sonar Qube基本使用

Sonar Qube的使用方式很多，Maven可以整合，也可以采用sonar-scanner的方式，再查看Sonar Qube的检测效果

### 7.3.1 Maven实现代码检测

- 修改Maven的settings.xml文件配置Sonar Qube信息

```
<profile>
  <id>sonar</id>
  <activation>
    <activeByDefault>true</activeByDefault>
  </activation>
  <properties>
    <sonar.login>admin</sonar.login>
    <sonar.password>123456789</sonar.password>
    <sonar.host.url>http://192.168.11.11:9000</sonar.host.url>
  </properties>
</profile>
```

- 在代码位置执行命令：mvn sonar:sonar

执行代码检测

```
C:\Windows\System32\cmd.exe
[INFO] Sensor VB.NET Project Type Information [vbnet] (done) | time=5ms
[INFO] Sensor VB.NET Properties [vbnet]
[INFO] Sensor VB.NET Properties [vbnet] (done) | time=8ms
[INFO] ----- Run sensors on project
[INFO] Sensor Zero Coverage Sensor
[INFO] Sensor Zero Coverage Sensor (done) | time=31ms
[INFO] Sensor Java CPD Block Indexer
[INFO] Sensor Java CPD Block Indexer (done) | time=20ms
[INFO] SCM Publisher SCM provider for this project is: git
[INFO] SCM Publisher 4 source files to be analyzed
[INFO] SCM Publisher 4/4 source files have been analyzed (done) | time=209ms
[INFO] CPD Executor 2 files had no CPD blocks
[INFO] CPD Executor Calculating CPD for 0 files
[INFO] CPD Executor CPD calculation finished (done) | time=1ms
[INFO] Analysis report generated in 125ms, dir size=105 KB
[INFO] Analysis report compressed in 55ms, zip size=18 KB
[INFO] Analysis report uploaded in 843ms
[INFO] ANALYSIS SUCCESSFUL, you can browse http://192.168.11.11:9000/dashboard?id=com.mashibing%3Ademo
[INFO] Note that you will be able to access the updated dashboard once the server has processed the submitted analysis report
[INFO] More about the report processing at http://192.168.11.11:9000/api/ce/task?id=AX1riyDNtWNYoeOV88CF
[INFO] Analysis total time: 14.674 s
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 19.379 s
[INFO] Finished at: 2021-11-29T19:53:41+08:00
[INFO] -----
```

D:\Desktop\demo>

- 查看Sonar Qube界面检测结果

Sonar Qube检测结果

### 7.3.2 Sonar-scanner实现代码检测

- 下载Sonar-scanner: <https://binaries.sonarsource.com/Distribution/sonar-scanner-cli/>  
下载4.6.x版本即可，要求Linux版本
- 解压并配置sonar服务端信息
  - 由于是zip压缩包，需要安装unzip解压插件

```
yum -y install unzip
```

- 解压压缩包

```
unzip sonar-scanner-cli/sonar-scanner-cli-4.6.0.2311-linux.zip
```

- 配置sonarQube服务端地址，修改conf下的sonar-scanner.properties

配置服务端信息

```
#Configure here general information about the environment, such as SonarQube server connection details for example
#No information about specific project should appear here

#----- Default SonarQube server
sonar.host.url=http://192.168.11.11:9000

#----- Default source code encoding
sonar.sourceEncoding=UTF-8
```

- 执行命令检测代码

```
# 在项目所在目录执行以下命令
~/sonar-scanner/bin/sonar-scanner -Dsonar.sources= ./ -Dsonar.projectname=demo -Dsonar.projectKey=java -Dsonar.java.binaries=target/
```

Ps: 主要查看我的sonar-scanner执行命令的位置

## 查看日志信息

```
[root@localhost demo]# ls
docker  pom.xml  src  target
[root@localhost demo]# ~/sonar-scanner/bin/sonar-scanner -Dsonar.sources=.. -Dsonar.projectname=demo -Dsonar.projectKey=java -Dsonar.java
.binaries=target/
INFO: Scanner configuration file: /root/sonar-scanner/conf/sonar-scanner.properties
INFO: Project root configuration file: NONE
INFO: SonarScanner 4.6.0.2311
INFO: Java 11.0.3 AdoptOpenJDK (64-bit)
INFO: Linux 3.10.0-1160.el7.x86_64 amd64
INFO: User cache: /root/.sonar/cache
INFO: Scanner configuration file: /root/sonar-scanner/conf/sonar-scanner.properties
INFO: Project root configuration file: NONE
INFO: Analyzing on SonarQube server 8.9.3
INFO: Default locale: "zh CN", source code encoding: "UTF-8"
省略部分日志.....
INFO: ANALYSIS SUCCESSFUL, you can browse http://192.168.11.11:9000/dashboard?id=java
INFO: Note that you will be able to access the updated dashboard once the server has processed the submitted analysis report
INFO: More about the report processing at http://192.168.11.11:9000/api/ce/task?id=AX1veC_TpG1NEVU1Cmsc
INFO: Analysis total time: 7.173 s
INFO: -----
INFO: EXECUTION SUCCESS
INFO: -----
INFO: Total time: 8.538s
INFO: Final Memory: 8M/30M
INFO: -----
```

- 查看SonarQube界面检测结果

The screenshot shows the SonarQube 'Analysis Results' page. It lists two projects: 'demo' and 'java'. The 'java' project is highlighted with a red box. Both projects show 0 bugs, 0 vulnerabilities, 0 code smells, 8 hotspots, 0% coverage, 0% reusability, and 66/73 lines of code respectively. The interface includes a sidebar for filtering and a search bar at the top.

## 7.4 Jenkins集成Sonar Qube

Jenkins继承Sonar Qube实现代码扫描需要先下载整合插件

### 7.4.1 Jenkins安装插件

**下载Sonar Qube插件**

The figure consists of three vertically stacked screenshots of the Jenkins management interface.

- Screenshot 1: Management Jenkins**  
Shows the Jenkins dashboard with the "System Management" link highlighted by a red box. The main area displays various Jenkins management links like "System Configuration", "Global Tool Configuration", and "Plugin Management". A red box highlights the "Plugin Management" link.
- Screenshot 2: Plugin Management**  
Shows the "Plugin Management" page. A search bar contains "sonarqube". The "Available" tab is selected, highlighted by a red box. A red box highlights the "SonarQube Scanner" plugin entry, which includes a brief description and a "Install without restart" button.
- Screenshot 3: Update Center**  
Shows the "Update Center" page. The "Install/Update Plugins" section is titled "安装/更新 插件中". It shows the progress of the SonarQube Scanner plugin installation, with a green checkmark indicating success. It also provides a "Return to Home" link and a note about restarting Jenkins.

#### 7.4.2 Jenkins配置Sonar Qube

- 开启Sonar Qube权限验证

### 开启Sonar Qube权限校验

配置 - 权限 - 项目 - 系统 - 应用市场

通用设置  
编辑SonarQube实例的全局设置。

权限

Enable local webhooks validation  
Forcing local webhooks validation prevents the creation and triggering of local webhooks. Disabling this setting can expose the instance to security risks.  
标记: sonar.validateWebhooks

Enable permission management for project administrators  
Set if users with 'Administrator' role in a project should be allowed to change project permissions. By default users with 'Administrator' role are allowed to change both project configuration and project permissions.  
标记: sonar.allowPermissionManagementForProjectA...

Force user authentication  
Forcing user authentication prevents anonymous users from accessing the SonarQube UI, or project data via the Web API. Some specific read-only Web APIs, including those required to prompt authentication, are still available anonymously. Disabling this setting can expose the instance to security risks.  
标记: sonar.forceAuthentication

- 获取Sonar Qube的令牌

### 获取令牌

sonarcube 项目 问题 代码规则 质量配置 质量阈 配置

A Administrator 配置 安全 提醒 项目

令牌  
如果增强化安全，不想在执行代码扫描或调用Web Service时使用真实SonarQube用户的密码，可以使用用户令牌来代替用户登录。这样可以通过避免把用户的密码在网络上传播，从而提升安全性。

生成令牌 ① 填写一个名称, 生成Token  
填写令牌名称 生成

① 创建了新令牌 "admin"。请立即复制, 不会再显示第二次!  
[ 复制 ] ca38b7ca478339a1b2bf1b4dd0568d49178bfe5... ③

- 配置Jenkins的Sonar Qube信息

**管理 Jenkins**

系统配置

全局安全配置

In-process Script Approval

Manage Credentials

凭据配置

管理用户

SonarQube servers

Name: SonarQube

Server URL: http://192.168.11.11:9000/

Server authentication token: Jenkins连接SonarQube的Token

Add SonarQube

Jenkins凭据提供者: Jenkins

添加凭据

Domain: 全局凭据 (unrestricted)

类型: Secret text

范围: 全局 (Jenkins, nodes, items, all child items, etc)

Secret: (Redacted)

ID: (Redacted)

描述: Jenkins连接SonarQube的Token

① 选择Secret text  
② 填写SonarQube生成的令牌  
③ 添加一段描述

#### 7.4.3 配置Sonar-scanner

- 将Sonar-scanner添加到Jenkins数据卷中并配置全局配置

配置Sonar-scanner

Dashboard ➔ 全局工具配置

SonarQube Scanner 安装

新增 SonarQube Scanner

SonarQube Scanner Name: sonar-scanner

SONAR\_RUNNER\_HOME: /var/jenkins\_home/sonar-scanner

自动安装

继续 SonarQube Scanner

- 配置任务的Sonar-scanner

Dashboard > test >

General 源码管理 构建触发器 构建环境 构建 构建后操作

**构建**

Execute SonarQube Scanner Task to run ?

JDK ? jdk JDK to be used for this SonarQube analysis

Path to project properties ?

Analysis properties ?

```
sonar.projectname=${JOB_NAME}
sonar.projectKey=${JOB_NAME}
sonar.sources=
sonar.java.binaries=target/
```

#### 7.4.4 构建任务

控制台输出

```
Started by user root
Running as SYSTEM
Building in workspace /var/jenkins_home/workspace/test
The recommended git tool is: NONE
No credentials specified
> git rev-parse --resolve-git-dir /var/jenkins_home/workspace/test/.git # timeout=10
Fetching changes from the remote Git repository
> git config remote.origin.url http://49.233.115.171:8929/root/test.git # timeout=10
Fetching upstream changes from http://49.233.115.171:8929/root/test.git
> git --version # timeout=10
> git fetch --tags --force --progress -- http://49.233.115.171:8929/root/test.git +refs/heads/* refs/remotes/origin/* # timeout=10
> git rev-parse refs/remotes/origin/master^{commit} # timeout=10
Checking out Revision efa79aab9ddc514030676f21b4a80f854abc41a1b (refs/remotes/origin/master)
> git config core.sparsecheckout # timeout=10
> git checkout -f efa79aab9ddc514030676f21b4a80f854abc41a1b # timeout=10
Commit message: "版本2.0.0"
> git rev-list --no-walk efa79aab9ddc514030676f21b4a80f854abc41a1b # timeout=10
[test] $ /var/jenkins_home/bin/sonar-scanner -Dsonar.host.url=http://192.168.11.11:9000/ **** -Dsonar.projectKey=test -Dsonar.projectname=test -Dsonar.java.binaries=target/ -Dsonar.sources=/
Dsonar.projectBaseDir=/var/jenkins_home/workspace/test
INFO: Scanner configuration file: /var/jenkins_home/sonar-scanner/conf/sonar-scanner.properties
INFO: Project root configuration file: NONE
INFO: ANALYSIS SUCCESSFUL, you can browse http://192.168.11.11:9000/dashboard?id=test
INFO: Note that you will be able to access the updated dashboard once the server has processed the submitted analysis report
INFO: More about the report processing at http://192.168.11.11:9000/api/ce/task?id=dAxiv2alppG1NEVU1cm1
INFO: Analysis total time: 8.682 s
INFO:
INFO: EXECUTION SUCCESS
INFO:
INFO: Total time: 10.385s
INFO: Final Memory: 9M/34M
INFO:
```

sonarqube 项目 问题 代码规则 质量配置 质量阈 配置 我的收藏 所有

搜索项目名或标识

最近一次分析: 20小时前

Bugs	漏洞	复审热点	异味	覆盖率	重复	行数
0 A	0 A	- A	8 A	0.0%	0.0%	66 X8 XML, Java

最近一次分析: 4分钟前

Bugs	漏洞	复审热点	异味	覆盖率	重复	行数
0 A	0 A	- A	8 A	0.0%	0.0%	73 X9 XML, Java

最近一次分析: 3分钟前

Bugs	漏洞	复审热点	异味	覆盖率	重复	行数
0 A	0 A	- A	8 A	0.0%	0.0%	73 X9 XML, Java

## 八、集成Harbor

### 8.1 Harbor介绍

前面在部署项目时，我们主要采用Jenkins推送jar包到指定服务器，再通过脚本命令让目标服务器对当前jar进行部署，这种方式在项目较多时，每个目标服务器都需要将jar包制作成自定义镜像再通过docker进行启动，重复操作比较多，会降低项目部署时间。

我们可以通过Harbor作为私有的Docker镜像仓库。让Jenkins统一将项目打包并制作成Docker镜像发布到Harbor仓库中，只需要通知目标服务，让目标服务统一去Harbor仓库上拉取镜像并在本地部署即可。

Docker官方提供了Registry镜像仓库，但是Registry的功能相对简陋。Harbor是VMware公司提供的一款镜像仓库，提供了权限控制、分布式发布、强大的安全扫描与审查机制等功能。

### 8.2 Harbor安装

这里采用原生的方式安装Harbor。

- 下载Harbor安装包：<https://github.com/goharbor/harbor/releases/download/v2.3.4/harbor-offline-installer-v2.3.4.tgz>

- 拖拽到Linux并解压：

```
tar -zxvf harbor-offline-installer-v2.3.4.tgz -C /usr/local/
```

- 修改Harbor配置文件：

- 首先复制一份harbor.yml配置

```
cp harbor.yml.tpl harbor.yml
```

- 编辑harbor.yml配置文件

配置Harbor文件

```
[root@localhost harbor]# cat harbor.yml
# Configuration file of Harbor

# The IP address or hostname to access admin UI and registry service.
# DO NOT use localhost or 127.0.0.1, because Harbor needs to be accessed by external clients.
hostname: 192.168.11.11 [设置为Harbor地址]

# http related config
http:
  # port for http, default is 80. If https enabled, this port will redirect to https port
  port: 80

# https related config
#https:
  # https port for harbor, default is 443
  # port: 443
  # The path of cert and key files for nginx
  # certificate: /your/certificate/path
  # private_key: /your/private/key/path

  # # Uncomment following will enable tls communication between all harbor components
  # internal_tls:
  #   # set enabled to true means internal tls is enabled
  #   # enabled: true
  #   # put your cert and key files on dir
  #   # dir: /etc/harbor/tls/internal

  # Uncomment external_url if you want to enable external proxy
  # And when it enabled the hostname will no longer used
  # external_url: https://reg.mydomain.com:8433

  # The initial password of Harbor admin
  # It only works in first time to install harbor
  # Remember Change the admin password from UI after launching Harbor.
  harbor_admin_password: Harbor12345 [admin用户默认密码]
```

注释HTTPS

- 启动Harbor

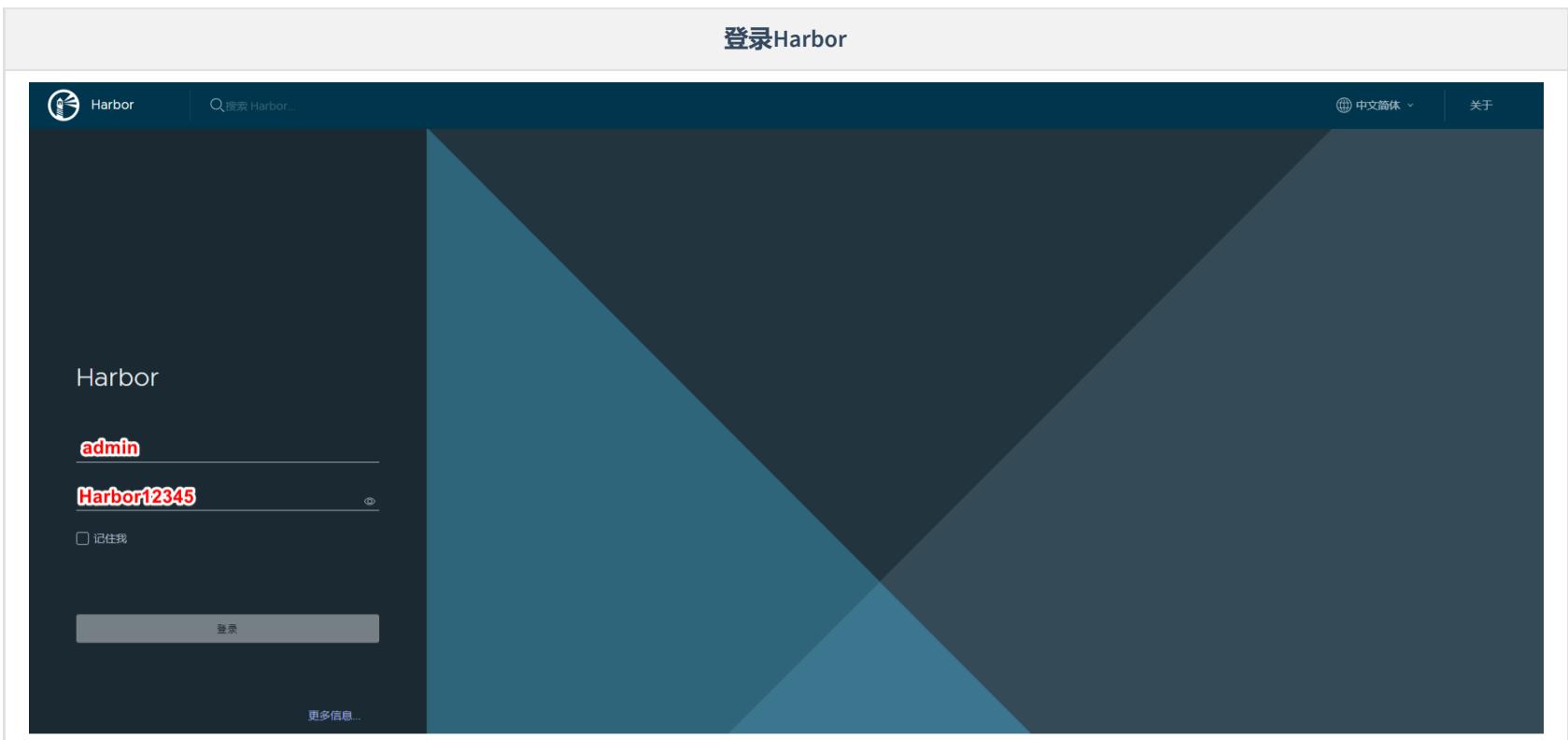
```
./install.sh
```

### 查看日志

```
[root@localhost harbor]# ./install.sh
prepare base dir is set to /usr/local/harbor 省略部分日志.....
WARNING:root:WARNING: HTTP protocol is insecure. Harbor will deprecate http protocol in the future. Please make sure to upgrade to https
Generated configuration file: /config/portal/nginx.conf
Generated configuration file: /config/log/logrotate.conf
Generated configuration file: /config/log/rsyslog_docker.conf
Generated configuration file: /config/nginx/nginx.conf
Generated configuration file: /config/core/env
Generated configuration file: /config/core/app.conf
Generated configuration file: /config/registry/config.yml
Generated configuration file: /config/registryctl/env
Generated configuration file: /config/registryctl/config.yml
Generated configuration file: /config/db/env
Generated configuration file: /config/jobservice/env
Generated configuration file: /config/jobservice/config.yml
Generated and saved secret to file: /data/secret/keys/secretkey
Successfully called func: create_root_cert
Generated configuration file: /compose_location/docker-compose.yml
Clean up the input dir

[Step 5]: starting Harbor ...
Creating network "harbor_harbor" with the default driver
Creating harbor-log ... done
Creating registry ... done
Creating redis ... done
Creating harbor-portal ... done
Creating registryctl ... done
Creating harbor-db ... done
Creating harbor-core ... done
Creating nginx ... done
Creating harbor-jobservice ... done
✓ ----Harbor has been installed and started successfully-----
```

- 登录Harbor



- 首页信息

### 首页信息

## 8.3 Harbor使用方式

Harbor作为镜像仓库，主要的交互方式就是将镜像上传到Harbor上，以及从Harbor上下载指定镜像

在传输镜像前，可以先使用Harbor提供的权限管理，将项目设置为私有项目，并对不同用户设置不同角色，从而更方便管理镜像。

### 8.3.1 添加用户构建项目

- 创建用户

### 创建用户

- 构建项目（设置为私有）

**构建项目**

The screenshot shows the Harbor interface for creating a new project. A modal window titled '新建项目' (Create New Project) is open. Inside, there are fields for '项目名称' (Project Name) set to 'repository', '访问级别' (Access Level) set to '公开' (Public), '存储容量' (Storage Capacity) set to '-1 GiB', and a toggle switch for '镜像代理' (Image Mirror). The 'repository' field is highlighted with a red box.

- 给项目追加用户

**追加用户管理**

The screenshot shows the Harbor interface for adding members to a project. A modal window titled '新建成员' (New Member) is open, showing a list of users and their assigned roles. One user, 'admin', is listed under the 'repository' project. A role named 'DevOps' is selected and highlighted with a red box. Other roles listed include '项目管理员' (Project Manager), '维护人员' (Maintenance Personnel), '开发者' (Developer), '访客' (Guest), and '受限访客' (Limited Guest).

- 切换测试用户

**切换测试用户**

The screenshot shows the Harbor login page. On the left, there is a sidebar with the 'DevOps' role selected. The main area contains a login form with fields for '用户名' (Username) and '密码' (Password), and a '记住我' (Remember Me) checkbox. At the bottom is a blue '登录' (Login) button.

### 8.3.2 发布镜像到Harbor

- 修改镜像名称

名称要求: **harbor地址/项目名/镜像名:版本**

**修改镜像名称**

```
[root@localhost harbor]# docker images
REPOSITORY          TAG        IMAGE ID      CREATED       SIZE
demo               v1.0.0     84931beaefa3   30 hours ago  337MB
sonarqube_docker_sonarqube    latest     c53543dd1065   5 days ago   549MB
adoptopenjdk/openjdk8      latest     f5be1fb5cc77   6 days ago   320MB
jenkins/jenkins         latest     a7aa4a28243e   7 days ago   442MB
sonarqube              9.2.0-community 60e2c441f386   11 days ago  549MB
[root@localhost harbor]# docker tag demo:v1.0.0 192.168.11.11:80/repository/demo:v1.0.0
[root@localhost harbor]# docker images
REPOSITORY          TAG        IMAGE ID      CREATED       SIZE
192.168.11.11:80/repository/demo  v1.0.0     84931beaefa3   30 hours ago  337MB
demo               v1.0.0     84931beaefa3   30 hours ago  337MB
sonarqube_docker_sonarqube    latest     c53543dd1065   5 days ago   549MB
adoptopenjdk/openjdk8      latest     f5be1fb5cc77   6 days ago   320MB
jenkins/jenkins         latest     a7aa4a28243e   7 days ago   442MB
sonarqube              9.2.0-community 60e2c441f386   11 days ago  549MB
sonarqube              latest     60e2c441f386   11 days ago  549MB
```

- 修改daemon.json, 支持Docker仓库, 并重启Docker

### 修改daemon.json，支持Docker仓库

```
[root@localhost harbor]# vi /etc/docker/daemon.json
{
    "registry-mirrors": ["https://pee6w651.mirror.aliyuncs.com"],
    "insecure-registries": ["192.168.11.11:80"]
}
```

- 设置登录仓库信息

```
docker login -u 用户名 -p 密码 Harbor地址
```

- 推送镜像到Harbor

### 推送镜像到Harbor

```
[root@localhost harbor]# docker push 192.168.11.11:80/repository/demo:v1.0.0
The push refers to repository [192.168.11.11/repository/demo]
Get "https://192.168.11.11/v2/: dial tcp 192.168.11.11:443: connect: connection refused
[root@localhost harbor]# docker login -u DevOps -p Pssw0rd 192.168.11.11:80
WARNING! Using --password via the CLI is insecure. Use --password-stdin.
WARNING! Your password will be stored unencrypted in /root/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
[root@localhost harbor]# docker push 192.168.11.11:80/repository/demo:v1.0.0
The push refers to repository [192.168.11.11:80/repository/demo]
6f787146b6fe: Pushing [=====] 16.8MB
f81ef5ffca5f: Pushing [==>] 10.9MB/204.3MB
384b03864c54: Pushing [=====] 10.4MB/43.19MB
```



### 8.3.3 从Harbor拉取镜像ls

跟传统方式一样，不过需要先配置 `/etc/docker/daemon.json` 文件

```
{  
    "registry-mirrors": ["https://pee6w651.mirror.aliyuncs.com"],  
    "insecure-registries": ["192.168.11.11:80"]  
}
```

### 拉取镜像

```
[root@localhost harbor]# docker pull 192.168.11.11:80/repository/demo:v1.0.0  
v1.0.0: Pulling from repository/demo  
Digest: sha256:d690f8cc98719afc954e1cf8ff16722ab9cf7e37ae7f146562289a1287945423  
Status: Downloaded newer image for 192.168.11.11:80/repository/demo:v1.0.0  
192.168.11.11:80/repository/demo:v1.0.0
```

### 8.3.4 Jenkins容器使用宿主机Docker

构建镜像和发布镜像到harbor都需要使用到docker命令。而在Jenkins容器内部安装Docker官方推荐直接采用宿主机带的Docker即可。

设置Jenkins容器使用宿主机Docker

- 设置宿主机docker.sock权限：

```
sudo chown root:root /var/run/docker.sock  
sudo chmod 0+rw /var/run/docker.sock
```

- 添加数据卷

```
version: "3.1"  
services:  
  jenkins:  
    image: jenkins/jenkins  
    container_name: jenkins  
    ports:  
      - 8080:8080  
      - 50000:50000  
    volumes:  
      - ./data:/var/jenkins_home/  
      - /usr/bin/docker:/usr/bin/docker  
      - /var/run/docker.sock:/var/run/docker.sock  
      - /etc/docker/daemon.json:/etc/docker/daemon.json
```

### 8.3.5 添加构建操作

制作自定义镜像

```

General 源码管理 构建触发器 构建环境 构建 构建后操作
执行 shell
命令
mv target/*.jar docker/
docker build -t mytest:$tag docker/
docker login -u admin -p Harbor12345 192.168.11.102:80
docker tag mytest:$tag 192.168.11.102:80/repo/mytest:$tag
docker push 192.168.11.102:80/repo/mytest:$tag

```

查看 可用的环境变量列表

高级...

增加构建步骤 ▾

### 8.3.6 编写部署脚本

部署项目需要通过 Publish Over SSH 插件，让目标服务器执行命令。为了方便一次性实现拉取镜像和启动的命令，推荐采用脚本文件的方式。

添加脚本文件到目标服务器，再通过 Publish Over SSH 插件让目标服务器执行脚本即可。

- 编写脚本文件，添加到目标服务器

```

harbor_url=$1
harbor_project_name=$2
project_name=$3
tag=$4
port=$5

imageName=$harbor_url/$harbor_project_name/$project_name:$tag

containerId=`docker ps -a | grep ${project_name} | awk '{print $1}'``
if [ "$containerId" != "" ] ; then
    docker stop $containerId
    docker rm $containerId
    echo "Delete Container Success"
fi

imageId=`docker images | grep ${project_name} | awk '{print $3}'``

if [ "$imageId" != "" ] ; then
    docker rmi -f $imageId
    echo "Delete Image Success"
fi

docker login -u DevOps -p P@ssw0rd $harbor_url

docker pull $imageName

docker run -d -p $port:$port --name $project_name $imageName

echo "Start Container Success"
echo $project_name

```

并设置权限为可执行

```
chmod a+x deploy.sh
```

如图

```

[root@localhost bin]# pwd
/usr/local/bin
[root@localhost bin]# ls
deploy.sh

```

### 8.3.7 配置构建后操作

执行脚本文件

Dashboard > mytest >

General 源码管理 构建触发器 构建环境 构建 构建后操作

SSH Publishers

SSH Server  
Name: test

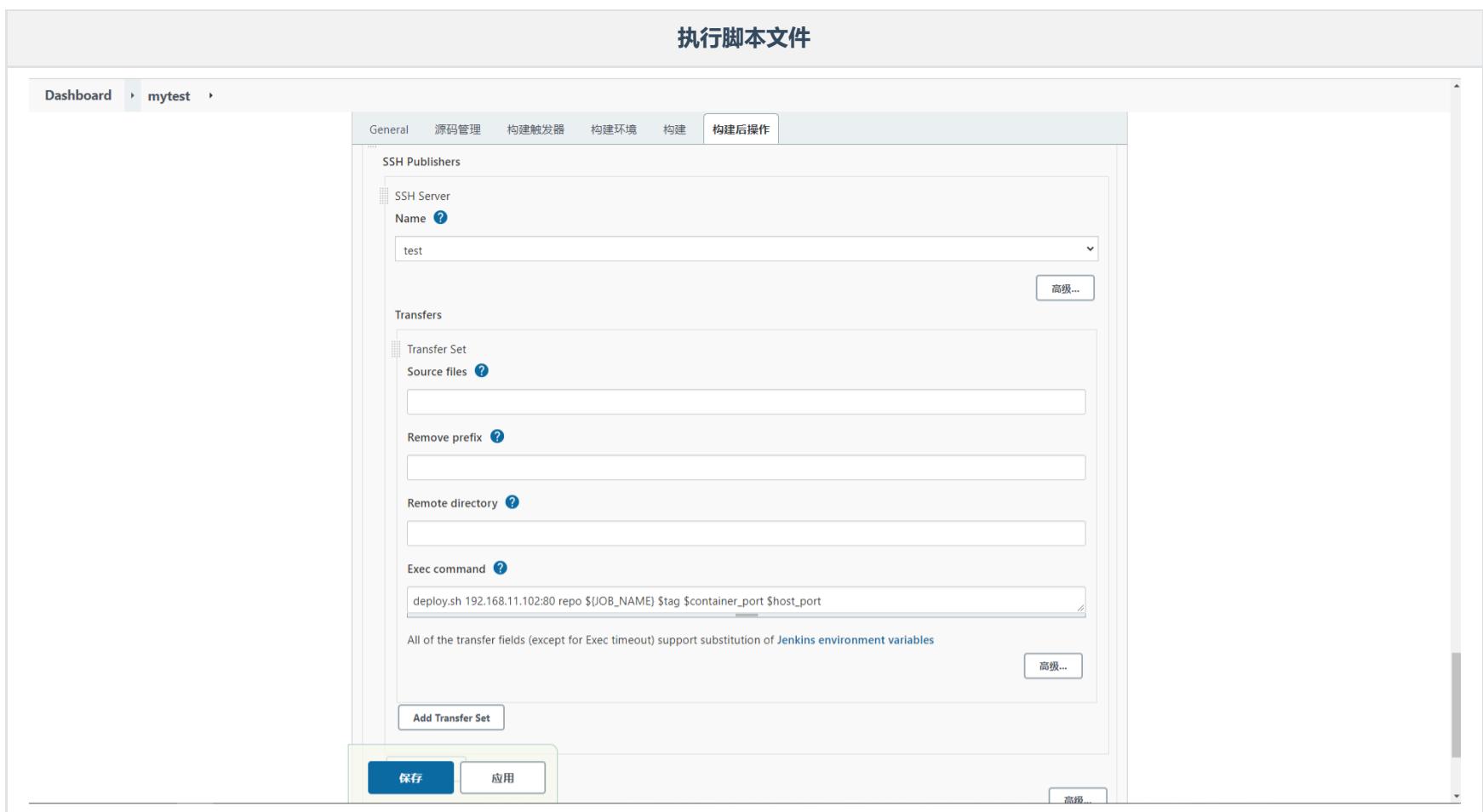
Transfers

Transfer Set  
Source files:   
Remove prefix:   
Remote directory:   
Exec command:

All of the transfer fields (except for Exec timeout) support substitution of Jenkins environment variables

Add Transfer Set

保存 应用 高级...



## 九、Jenkins流水线

### 9.1 Jenkins流水线任务介绍

之前采用Jenkins的自由风格构建的项目，每个步骤流程都要通过不同的方式设置，并且构建过程中整体流程是不可见的，无法确认每个流程花费的时间，并且问题不方便定位问题。

Jenkins的Pipeline可以让项目的发布整体流程可视化，明确执行的阶段，可以快速的定位问题。并且整个项目的生命周期可以通过一个Jenkinsfile文件管理，而且Jenkinsfile文件是可以放在项目中维护。

所以Pipeline相对自由风格或者其他项目风格更容易操作。

### 9.2 Jenkins流水线任务

#### 9.2.1 构建Jenkins流水线任务

- 构建任务

构建Jenkins流水线任务

Dashboard > 所有 >

输入一个任务名称: pipeline

必填项

构建一个自由风格的软件项目  
这是Jenkins的主要功能Jenkins将会结合任何SCM和任何构建系统来构建你的项目，甚至可以构建软件以外的系统。

流水线  
精心地组织一个可以长期运行在多个节点上的任务，适用于构建流水线（更加正式地应当称为工作流），增加或者组织难以采用自由风格的任务类型。

构建一个多配置项目  
适用于多配置项目,例如多环境测试,平台指定构建,等等。

(0) 文件夹  
Creates a set of multibranch project subfolders by scanning for repositories.

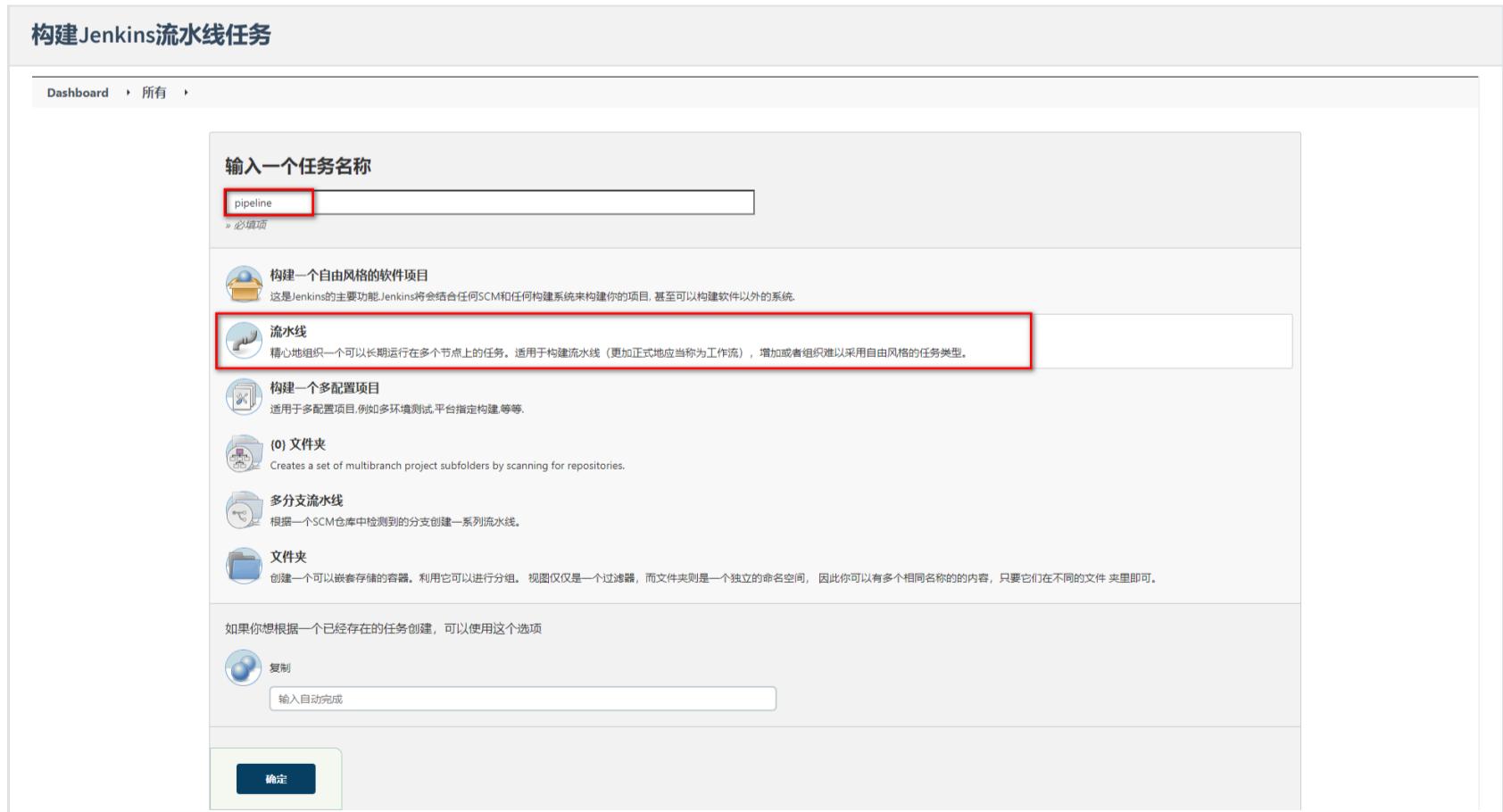
多分支流水线  
根据一个SCM仓库中检测到的分支创建一系列流水线。

文件夹  
创建一个可以嵌套存储的容器。利用它可以进行分组。根目录仅仅是一个过滤器，而文件夹则是一个独立的命名空间，因此你可以有多个相同名称的内容，只要它们在不同的文件夹里即可。

如果你想根据一个已经存在的任务创建，可以使用这个选项

复制  
输入自动完成:

确定



- 生成Groovy脚本



- 构建后查看视图



### 9.2.2 Groovy脚本

- Groovy脚本基础语法

```
// 所有脚本命令包含在pipeline{}中
pipeline {
    // 指定任务在哪个节点执行（Jenkins支持分布式）
    agent any

    // 配置全局环境，指定变量名=变量值信息
    environment{
        host = '192.168.11.11'
    }

    // 存放所有任务的合集
    stages {
        // 单个任务
        stage('任务1') {
            // 实现任务的具体流程
            steps {
                echo 'do something'
            }
        }
        // 单个任务
        stage('任务2') {
            // 实现任务的具体流程
            steps {
                echo 'do something'
            }
        }
        // .....
    }
}
```

- 编写例子测试

```

pipeline {
    agent any

    // 存放所有任务的合集
    stages {
        stage('拉取Git代码') {
            steps {
                echo '拉取Git代码'
            }
        }

        stage('检测代码质量') {
            steps {
                echo '检测代码质量'
            }
        }

        stage('构建代码') {
            steps {
                echo '构建代码'
            }
        }

        stage('制作自定义镜像并发布Harbor') {
            steps {
                echo '制作自定义镜像并发布Harbor'
            }
        }

        stage('基于Harbor部署工程') {
            steps {
                echo '基于Harbor部署工程'
            }
        }
    }
}

```



- 查看效果

The screenshot shows the Jenkins Pipeline status page for the 'Pipeline pipeline'. The left sidebar has '立即构建' (Build Now) highlighted with a red box. Other options like '完整阶段视图' (Full Stage View) are also highlighted. The main content area shows the 'Pipeline pipeline' title and a '阶段视图' (Stage View) chart. The chart has five bars representing different stages: '拉取Git代码' (88ms), '检测代码质量' (108ms), '构建代码' (106ms), '制作自定义镜像并发布Harbor' (76ms), and '基于Harbor部署工程' (72ms). The entire chart area is highlighted with a red box. Below the chart is a '相关链接' (Related Links) section with several links.

阶段	平均耗时
拉取Git代码	88ms
检测代码质量	108ms
构建代码	106ms
制作自定义镜像并发布Harbor	76ms
基于Harbor部署工程	72ms

Ps: 涉及到特定脚本, Jenkins给予了充足的提示, 可以自动生成命令

**生成命令位置**

**概览**

This Snippet Generator will help you learn the Pipeline Script code which can be used to define various steps. Pick a step you are interested in from the list, configure it, click **Generate Pipeline Script**, and you will see a Pipeline Script statement that would call the step with that configuration. You may copy and paste the whole statement into your script, or pick up just the options you care about. (Most parameters are optional and can be omitted in your script, leaving them at default values.)

**步骤**

示例步骤

archiveArtifacts: 归档成品  
archiveArtifacts: 归档成品  
bat: Windows Batch Script  
build: Build a job  
catchError: Catch error and set build result to failure  
checkout: Check out from version control  
cleanWs: Delete workspace when build is done  
deleteDir: Recursively delete the current directory from the workspace  
dir: Change current directory  
echo: Print Message  
emailexit: Extended Email  
emailexrecipients: Extended Email Recipients  
error: Error signal  
fileExists: Verify if file exists in workspace  
findBuildScans: Find published build scans  
fingerprint: 记录文件的指纹用于追踪  
git: Git  
input: 等待交互式输入  
isUnix: Checks if running on a Unix-like node  
junit: Archive JUnit-formatted test results  
library: Load a shared library on the fly

**全局变量**

There are many features of the Pipeline that are not steps. These are often exposed via global variables, which are not supported by the snippet generator. See the [Global Variables Reference](#) for details.

### 9.2.3 Jenkinsfile实现

Jenkinsfile方式需要将脚本内容编写到项目中的Jenkinsfile文件中，每次构建会自动拉取项目并且获取项目中Jenkinsfile文件对项目进行构建

- 配置pipeline

**配置pipeline**

Dashboard > pipeline >

General 构建触发器 高级项目选项 流水线

定义

Pipeline script from SCM ①

SCM ②

Git

Repositories ③

Repository URL ④

http://49.233.115.171:8929/root/test.git ⑤

Credentials ⑥

- 无 -

Branches to build ⑦

指定分支 (为空时代表any) ⑧

/master

增加分支

保存 应用

- 准备Jenkinsfile

**准备Jenkinsfile文件**

test

master test Jenkinsfile

Add Jenkinsfile

Administrator authored just now

Jenkinsfile 736 Bytes

```

1 pipeline {
2   agent any
3
4   // 有以下所有任务的合集
5   stages {
6     stage("拉取Git代码") {
7       steps {
8         echo '拉取Git代码'
9       }
10    }
11
12    stage("检测代码质量") {
13      steps {
14        echo '检测代码质量'
15      }
16    }
17
18    stage("构建代码") {
19      steps {
20        echo '构建代码'
21      }
22    }
23
24    stage("制作自定义镜像并发布Harbor") {
25      steps {
26        echo '制作自定义镜像并发布Harbor'
27      }
28    }
29
30    stage("基于Harbor部署工程") {
31      steps {
32        echo '基于Harbor部署工程'
33      }
34    }
35  }
36}

```

Find file Blame History Permalink

e11165ae

- 测试效果

The screenshot shows the Jenkins Pipeline pipeline test results. The main title is "Pipeline pipeline". On the left, there's a sidebar with options like "立即构建" (Build Now), "状态" (Status), and "阶段视图" (Stage View). The "阶段视图" section has a red box around the first stage, "Declarative: Checkout SCM", which took 571ms. Below it is a table of execution times for various stages:

阶段	平均耗时
Declarative: Checkout SCM	571ms
拉取Git代码	102ms
检测代码质量	70ms
构建代码	57ms
制作自定义镜像并发布Harbor部署工程	79ms
基于Harbor部署工程	61ms

## 9.3 Jenkins流水线任务实现

### 9.3.1 参数化构建

添加参数化构建，方便选择不同的项目版本

The screenshot shows the Jenkins Pipeline configuration for a "Git" step. The "General" tab is selected. A parameter named "tag" is defined with the description "根据标签拉取代码" (Pull code based on tag). The "参数类型" (Parameter Type) is set to "标签" (Tag). The "默认值" (Default Value) is "origin/master". A note at the top right says "后面编写脚本会用到" (Will be used in the script later).

### 9.3.2 拉取Git代码

通过流水线语法生成Checkout代码的脚本

The screenshot shows the Jenkins Snippet Generator interface. The title is "语法生成". The "步骤" (Step) section shows a "Shell Script" example. The generated Pipeline script is:

```
sh '/var/jenkins_home/sonar-scanner/bin/sonar-scanner -Dsonar.sources=../ -Dsonar.projectname=demo -Dsonar.projectKey=java -Dsonar.java.binaries=target/'
```

将\*/master更改为标签 \${tag}

```
pipeline {
    agent any
    stages {

        stage('拉取Git代码') {
            steps {
                checkout([$class: 'GitSCM', branches: [[name: '${tag}']], extensions: [], userRemoteConfigs: [[url: 'http://49.233.115.171:8929/root/test.git']]])
            }
        }
    }
}
```

### 9.3.3 构建代码

通过脚本执行mvn的构建命令

```
pipeline {
    agent any
    stages {

        stage('拉取Git代码') {
            steps {
                checkout([$class: 'GitSCM', branches: [[name: '${tag}']], extensions: [], userRemoteConfigs: [[url: 'http://49.233.115.171:8929/root/test.git']]])
            }
        }

        stage('构建代码') {
            steps {
                sh '/var/jenkins_home/maven/bin/mvn clean package -DskipTests'
            }
        }
    }
}
```

### 9.3.4 代码质量检测

通过脚本执行sonar-scanner命令即可

```
pipeline {
    agent any
    stages {

        stage('拉取Git代码') {
            steps {
                checkout([$class: 'GitSCM', branches: [[name: '${tag}']], extensions: [], userRemoteConfigs: [[url: 'http://49.233.115.171:8929/root/test.git']]])
            }
        }

        stage('构建代码') {
            steps {
                sh '/var/jenkins_home/maven/bin/mvn clean package -DskipTests'
            }
        }
    }
}
```

```

        }

    stage('检测代码质量') {
        steps {
            sh '/var/jenkins_home/sonar-scanner/bin/sonar-scanner -Dsonar.sources=./ -Dsonar.projectname=${JOB_NAME} -Dsonar.projectKey=${JOB_NAME} -Dsonar.java.binaries=target/ -Dsonar.login=31388be45653876c1f51ec02f0d478e2d9d0e1fa'
        }
    }
}

```

### 9.3.5 制作自定义镜像并发布

- 生成自定义镜像脚本

```

pipeline {
    agent any
    environment{
        harborHost = '192.168.11.11:80'
        harborRepo = 'repository'
        harborUser = 'DevOps'
        harborPasswd = 'P@ssw0rd'
    }

    // 存放所有任务的合集
    stages {

        stage('拉取Git代码') {
            steps {
                checkout([$class: 'GitSCM', branches: [[name: '${tag}']], extensions: [], userRemoteConfigs: [[url: 'http://49.233.115.171:8929/root/test.git']]])
            }
        }

        stage('构建代码') {
            steps {
                sh '/var/jenkins_home/maven/bin/mvn clean package -DskipTests'
            }
        }

        stage('检测代码质量') {
            steps {
                sh '/var/jenkins_home/sonar-scanner/bin/sonar-scanner -Dsonar.sources=./ -Dsonar.projectname=${JOB_NAME} -Dsonar.projectKey=${JOB_NAME} -Dsonar.java.binaries=target/ -Dsonar.login=31388be45653876c1f51ec02f0d478e2d9d0e1fa'
            }
        }

        stage('制作自定义镜像并发布Harbor') {
            steps {
                sh '''cp ./target/*.jar ./docker/
cd ./docker
docker build -t ${JOB_NAME}:${tag} ./'''

                sh '''docker login -u ${harborUser} -p ${harborPasswd} ${harborHost}
docker tag ${JOB_NAME}:${tag} ${harborHost}/${harborRepo}/${JOB_NAME}:${tag}
docker push ${harborHost}/${harborRepo}/${JOB_NAME}:${tag}'''
            }
        }
    }
}

```

- 生成Publish Over SSH脚本

```

pipeline {
    agent any
    environment{
        harborHost = '192.168.11.11:80'
        harborRepo = 'repository'
        harborUser = 'DevOps'
        harborPasswd = 'P@ssw0rd'
    }

    // 存放所有任务的合集
    stages {

        stage('拉取Git代码') {
            steps {
                checkout([$class: 'GitSCM', branches: [[name: '${tag}']], extensions: [], userRemoteConfigs: [[url: 'http://49.233.115.171:8929/root/test.git']]])
            }
        }
    }
}

```

```

stage('构建代码') {
    steps {
        sh '/var/jenkins_home/maven/bin/mvn clean package -DskipTests'
    }
}

stage('检测代码质量') {
    steps {
        sh '/var/jenkins_home/sonar-scanner/bin/sonar-scanner -Dsonar.sources=. -Dsonar.projectname=${JOB_NAME} -Dsonar.projectKey=${JOB_NAME} -Dsonar.java.binaries=target/ -Dsonar.login=7d66af4b39cfe4f52ac0a915d4c9d5c513207098'
    }
}

stage('制作自定义镜像并发布Harbor') {
    steps {
        sh '''cp ./target/*.jar ./docker/
cd ./docker
docker build -t ${JOB_NAME}:${tag} .'''
        sh '''docker login -u ${harborUser} -p ${harborPasswd} ${harborHost}
docker tag ${JOB_NAME}:${tag} ${harborHost}/${harborRepo}/${JOB_NAME}:${tag}
docker push ${harborHost}/${harborRepo}/${JOB_NAME}:${tag}'''
    }
}

stage('目标服务器拉取镜像并运行') {
    steps {
        sshPublisher(publishers: [sshPublisherDesc(configName: 'testEnvironment', transfers: [sshTransfer(cleanRemote: false, excludes: '', execCommand: "/usr/bin/deploy.sh $harborHost $harborRepo $JOB_NAME $tag $port", execTimeout: 120000, flatten: false, makeEmptyDirs: false, noDefaultExcludes: false, patternSeparator: '[, ]+', remoteDirectory: '', remoteDirectorySDF: false, removePrefix: '', sourceFiles: '')], usePromotionTimestamp: false, useWorkspaceInPromotion: false, verbose: false)])
    }
}
}

```

**Ps: 由于采用变量, 记得使用双引号**

## 9.4 Jenkins流水线整合钉钉

在程序部署成功后, 可以通过钉钉的机器人及时向群众发送部署的最终结果通知

- 安装插件



- 钉钉内部创建群组并构建机器人

**钉钉内部创建群组并构建机器人**

The first screenshot shows the 'Group Settings' interface with a red box around the 'Smart Assistant' section. The second screenshot shows the 'Smart Assistant' interface with a red box around the 'Add Robot' button. The third screenshot shows the 'Robot' interface with a red box around the 'Customize' robot card.

**最终或获取到Webhook信息**

```
https://oapi.dingtalk.com/robot/send?access_token=kej4ehkj34gjhg34jh5bh5jb34hj53b4
```

- 系统配置添加钉钉通知

The configuration page includes fields for 'Notification Timing' (Build Start, Build Intermission, Build Failure, Build Success, Build Unstable, No Build), 'Robot ID' (Jenkins-DingDing), 'Name' (Jenkins-DingDing), 'Webhook' (https://oapi.dingtalk.com/robot/send?access\_token=cbdbac72a39cc2a746391f173bfb877acd13069ea82792ff9ac7cba2f279d30), 'Keywords' (Jenkins), and an optional 'Encryption' field. A green 'Test Success' message is shown at the bottom.

- 任务中追加流水线配置

```
pipeline {
```

```

agent any

environment {
    sonarLogin = '2bab7bf7d5af25e2c2ca2f178af2c3c55c64d5d8'
    harborUser = 'admin'
    harborPassword = 'Harbor12345'
    harborHost = '192.168.11.12:8888'
    harborRepo = 'repository'
}

stages {
    stage('拉取Git代码') {
        steps {
            checkout([$class: 'GitSCM', branches: [[name: '$tag']], extensions: [], userRemoteConfigs: [[url: 'http://49.233.115.171:8929/root/lsx.git']]])
        }
    }
    stage('Maven构建代码') {
        steps {
            sh '/var/jenkins_home/maven/bin/mvn clean package -DskipTests'
        }
    }
    stage('SonarQube检测代码') {
        steps {
            sh '/var/jenkins_home/sonar-scanner/bin/sonar-scanner -Dsonar.sources= ./ -Dsonar.projectname=${JOB_NAME} -Dsonar.projectKey=${JOB_NAME} -Dsonar.java.binaries=target/ -Dsonar.login=${sonarLogin}'
        }
    }
    stage('制作自定义镜像') {
        steps {
            sh '''cd docker
mv ./target/*.jar .
docker build -t ${JOB_NAME}:$tag .
''''
        }
    }
}

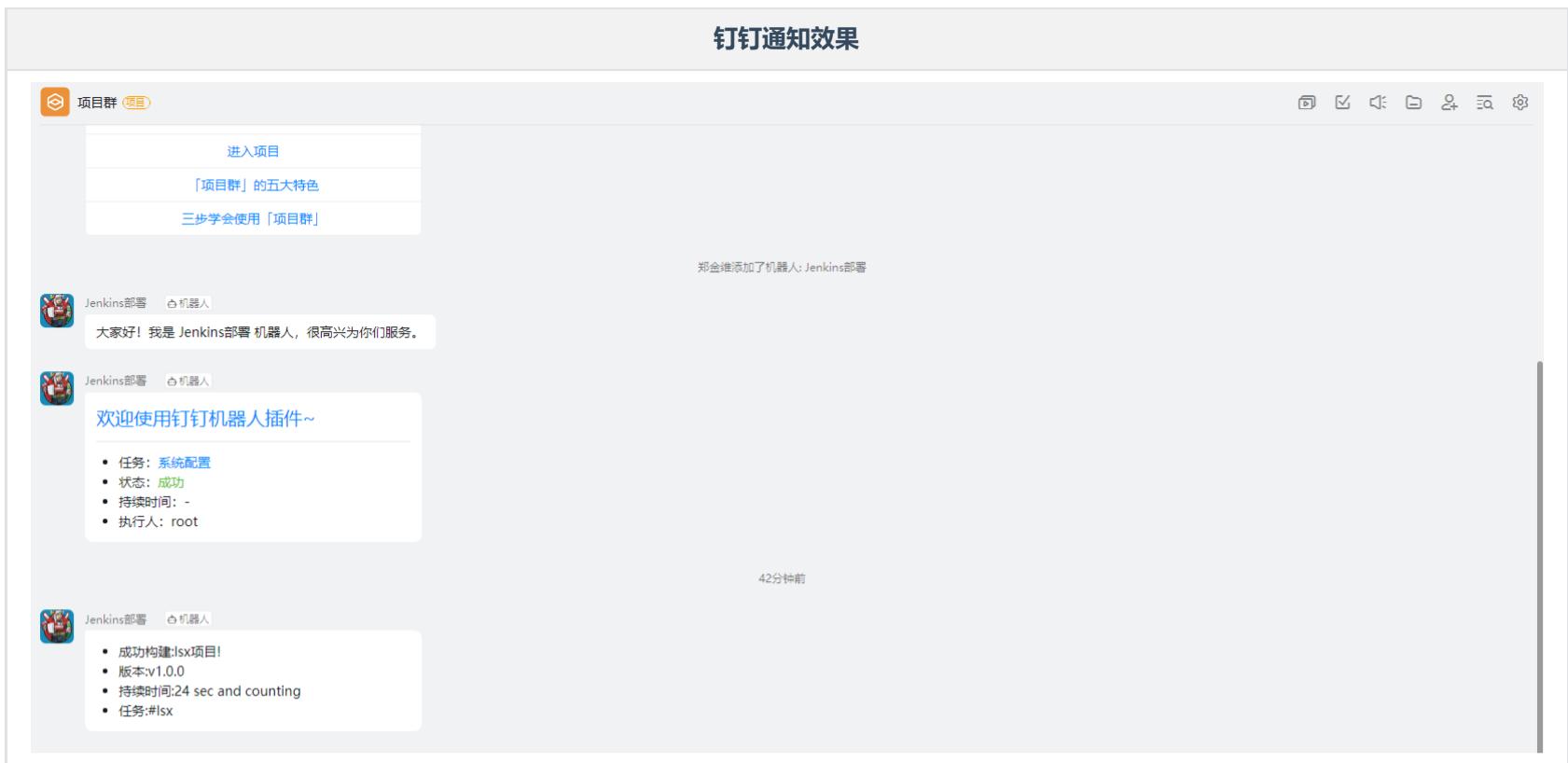
stage('推送自定义镜像') {
    steps {
        sh '''docker login -u ${harborUser} -p ${harborPassword} ${harborHost}
docker tag ${JOB_NAME}:$tag ${harborHost}/${harborRepo}/${JOB_NAME}:$tag
docker push ${harborHost}/${harborRepo}/${JOB_NAME}:$tag'''
    }
}

stage('通知目标服务器') {
    steps {
        sshPublisher(publishers: [sshPublisherDesc(configName: 'centos-docker', transfers: [sshTransfer(cleanRemote: false, excludes: '', execCommand: "/usr/bin/deploy.sh $harborHost $harborRepo $JOB_NAME $tag $port", execTimeout: 120000, flatten: false, makeEmptyDirs: false, noDefaultExcludes: false, patternSeparator: '[ , ]+', remoteDirectory: '', remoteDirectorySDF: false, removePrefix: '', sourceFiles: '')], usePromotionTimestamp: false, useWorkspaceInPromotion: false, verbose: false)])
    }
}

post {
    success {
        dingtalk (
            robot: 'Jenkins-DingDing',
            type:'MARKDOWN',
            title: "success: ${JOB_NAME}",
            text: ["- 成功构建:${JOB_NAME}项目!\n- 版本:${tag}\n- 持续时间:${currentBuild.durationString}\n- 任务:#${JOB_NAME}"]
        )
    }
    failure {
        dingtalk (
            robot: 'Jenkins-DingDing',
            type:'MARKDOWN',
            title: "fail: ${JOB_NAME}",
            text: ["- 失败构建:${JOB_NAME}项目!\n- 版本:${tag}\n- 持续时间:${currentBuild.durationString}\n- 任务:#${JOB_NAME}"]
        )
    }
}
}

```

- 查看效果



## 十、Kubernetes编排工具

### 10.1 Kubernetes介绍

Kubernetes是一个开源的，用于管理云平台中多个主机上的容器化的应用，Kubernetes的目标是让部署容器化的应用简单并且高效（powerful），Kubernetes提供了应用部署，规划，更新，维护的一种机制。

Kubernetes一个核心的特点就是能够自主的管理容器来保证云平台中的容器按照用户的期望状态运行着，管理员可以加载一个微型服务，让规划器来找到合适的位置，同时，Kubernetes也系统提升工具以及人性化方面，让用户能够方便的部署自己的应用。

Kubernetes主要能帮助我们完成：

- 服务发现和负载均衡

Kubernetes 可以使用 DNS 名称或自己的 IP 地址公开容器，如果进入容器的流量很大，Kubernetes 可以负载均衡并分配网络流量，从而使部署稳定。

- 存储编排

Kubernetes 允许你自动挂载你选择的存储系统，比如本地存储，类似Docker的数据卷。

- 自动部署和回滚

你可以使用 Kubernetes 描述已部署容器的所需状态，它可以以受控的速率将实际状态 更改为期望状态。Kubernetes 会自动帮你根据情况部署创建新容器，并删除现有容器给新容器提供资源。

- 自动完成装箱计算

Kubernetes 允许你设置每个容器的资源，比如CPU和内存。

- 自我修复

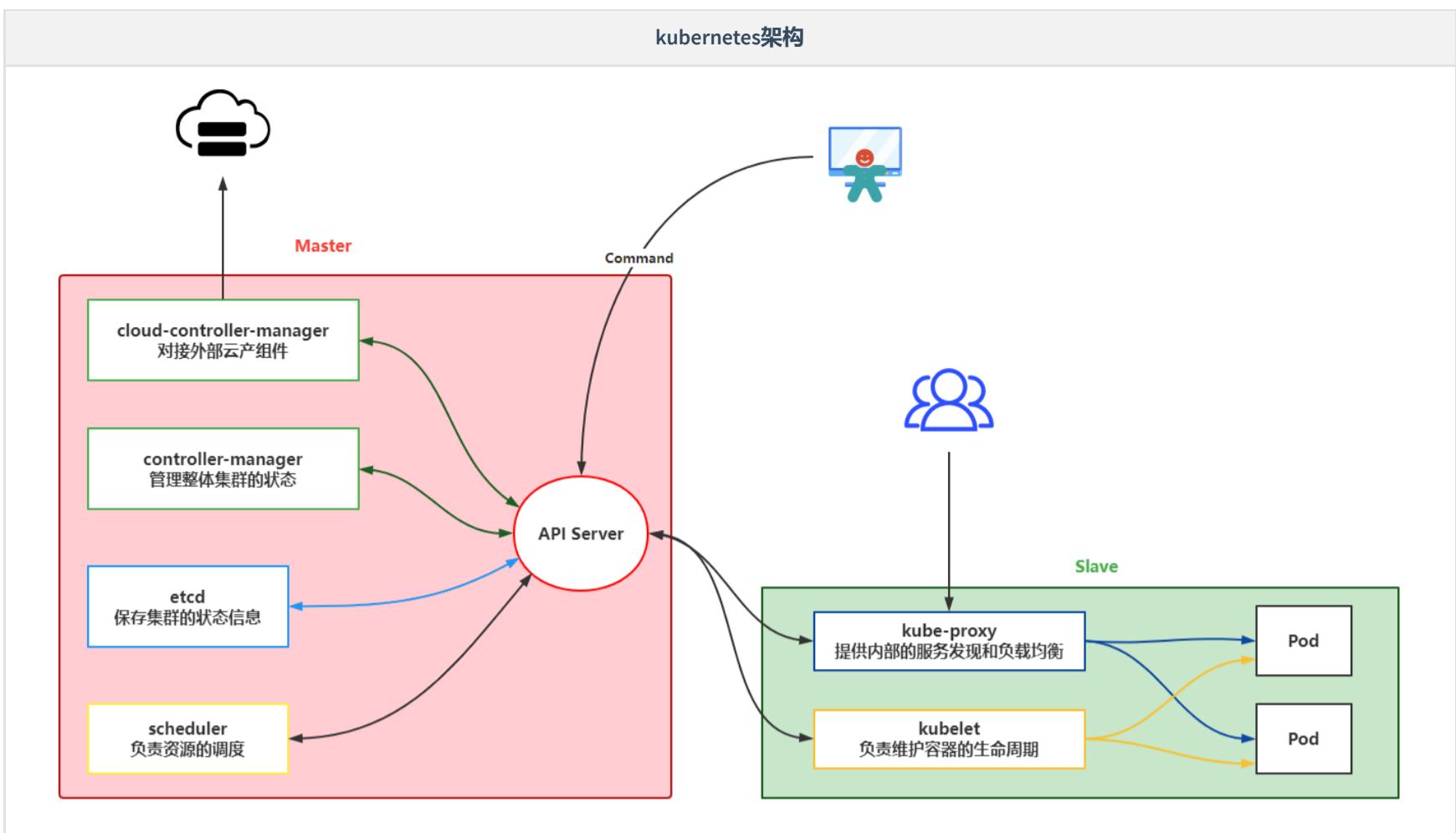
Kubernetes 重新启动失败的容器、替换容器、杀死不响应用户定义的容器，并运行状况检查的容器。

- 秘钥与配置管理

Kubernetes 允许你存储和管理敏感信息，例如密码、OAuth 令牌和 ssh 密钥。你可以在不重建容器镜像的情况下部署和更新密钥和应用程序配置，也无需在堆栈配置中暴露密钥。

### 10.2 Kubernetes架构

Kubernetes 搭建需要至少两个节点，一个Master负责管理，一个Slave搭建在工作服务器上负责分配。



从图中可以看到各个组件的基本功能：

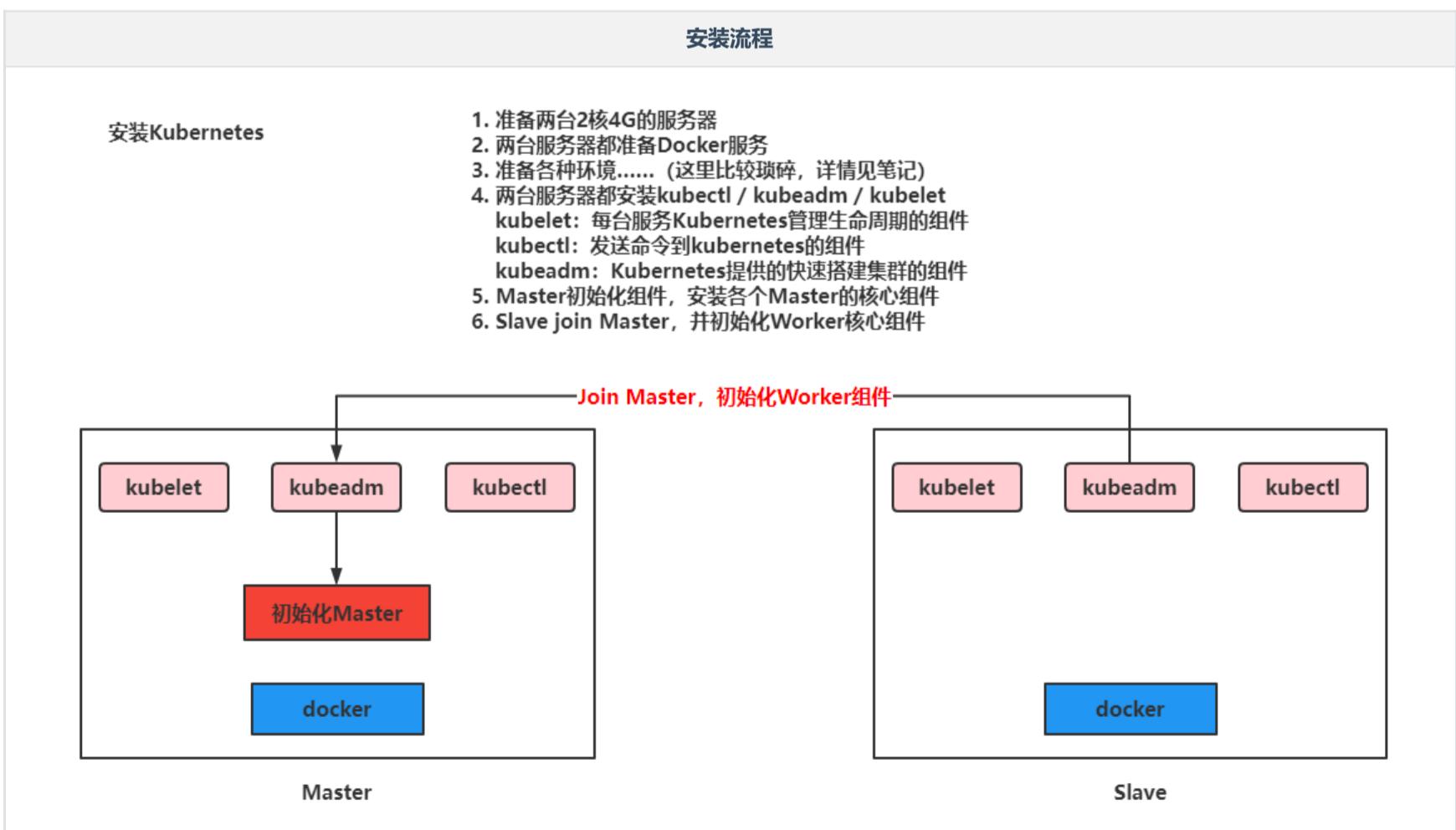
- API Server：作为K8s通讯的核心组件，K8s内部交互以及接收发送指令的组件。
- controller-manager：作为K8s的核心组件，主要做资源调度，根据集群情况分配资源
- etcd：一个key-value的数据库，存储集群的状态信息
- scheduler：负责调度每个工作节点
- cloud-controller-manager：负责调度其他云服务产品
- kubelet：管理Pods上面的容器。
- kube-proxy：负责处理其他Slave或客户端的请求。
- Pod：可以理解为就是运行的容器

### 10.3 Kubernetes安装

这里会采用 <https://kuboard.cn/> 提供的方式安装K8s，安装单Master节点

- 要求使用Centos7.8版本：[https://vault.centos.org/7.8.2003/isos/x86\\_64/CentOS-7-x86\\_64-Minimal-2003.iso](https://vault.centos.org/7.8.2003/isos/x86_64/CentOS-7-x86_64-Minimal-2003.iso)
- 至少2台 2核4G 的服务器

安装流程



```
# 修改 hostname, 名字不允许使用下划线、小数点、大写字母, 不能叫master
hostnamectl set-hostname your-new-host-name
# 查看修改结果
hostnamectl status
# 设置 hostname 解析
echo "127.0.0.1    $(hostname)" >> /etc/hosts
```

- 要求2台服务之间可以相互通讯

- 安装软件

```
# 阿里云 docker hub 镜像
export REGISTRY_MIRROR=https://registry.cn-hangzhou.aliyuncs.com
curl -sSL https://kuboard.cn/install-script/v1.19.x/install_kubelet.sh | sh -s 1.19.5
```

## 首先初始化Master节点

### 关于初始化时用到的环境变量

- APISERVER\_NAME 不能是 master 的 hostname
- APISERVER\_NAME 必须全为小写字母、数字、小数点, 不能包含减号
- POD\_SUBNET 所使用的网段不能与 master节点/worker节点 所在的网段重叠。该字段的取值为一个 CIDR 值, 如果您对 CIDR 这个概念还不熟悉, 请仍然执行 export POD\_SUBNET=10.100.0.0/16 命令, 不做修改

- 设置ip, 域名, 网段并执行初始化操作

```
# 只在 master 节点执行
# 替换 x.x.x.x 为 master 节点实际 IP (请使用内网 IP)
# export 命令只在当前 shell 会话中有效, 开启新的 shell 窗口后, 如果要继续安装过程, 请重新执行此处的 export 命令
export MASTER_IP=192.168.11.32
# 替换 apiserver.demo 为 您想要的 dnsName
export APISERVER_NAME=apiserver.demo
# Kubernetes 容器组所在的网段, 该网段安装完成后, 由 kubernetes 创建, 事先并不存在于您的物理网络中
export POD_SUBNET=10.100.0.1/16
echo "${MASTER_IP}    ${APISERVER_NAME}" >> /etc/hosts
curl -sSL https://kuboard.cn/install-script/v1.19.x/init_master.sh | sh -s 1.19.5
```

- 检查Master启动状态

```
# 只在 master 节点执行

# 执行如下命令, 等待 3-10 分钟, 直到所有的容器组处于 Running 状态
watch kubectl get pod -n kube-system -o wide

# 查看 master 节点初始化结果
kubectl get nodes -o wide
```

Ps: 如果出现NotReady的情况执行 (最新版本的BUG, 1.19一般没有)

```
docker pull quay.io/coreos/flannel:v0.10.0-amd64
mkdir -p /etc/cni/net.d/
cat <<EOF > /etc/cni/net.d/10-flannel.conf
{"name": "cbr0", "type": "flannel", "delegate": {"isDefaultGateway": true}}
EOF
mkdir /usr/share/oci-umount/oci-umount.d -p
mkdir /run/flannel/
cat <<EOF > /run/flannel/subnet.env
FLANNEL_NETWORK=172.100.0.0/16
FLANNEL_SUBNET=172.100.1.0/24
FLANNEL_MTU=1450
FLANNEL_IPMASQ=true
EOF
kubectl apply -f https://raw.githubusercontent.com/coreos/flannel/v0.9.1/Documentation/kube-flannel.yml
```

## 安装网络服务插件

```
export POD_SUBNET=10.100.0.0/16
kubectl apply -f https://kuboard.cn/install-script/v1.22.x/calico-operator.yaml
wget https://kuboard.cn/install-script/v1.22.x/calico-custom-resources.yaml
sed -i "s#192.168.0.0/16#${POD_SUBNET}#" calico-custom-resources.yaml
kubectl apply -f calico-custom-resources.yaml
```

## 初始化worker节点

- 获取Join命令参数, 在Master节点执行

```
# 只在 master 节点执行
kubeadm token create --print-join-command
```

### 获取命令

```
[root@localhost ~]# kubeadm token create --print-join-command
W1213 18:29:56.360597 37748 configset.go:348] WARNING: kubeadm cannot validate component configs for API groups [kubelet.config.k8s.io]
[ubeproxy.config.k8s.io]
kubeadm join apiserver.demo:6443 --token vwf1lu.3nhndohc5gn1jv9k      --discovery-token-ca-cert-hash sha256:22ff15cabfe87ab48a7db39b3bbf986
fee92ec92eb8efc7fe9b0abe2175ff0c2
```

- 在 worker 节点初始化

```
# 只在 worker 节点执行
# 替换 x.x.x.x 为 master 节点的内网 IP
export MASTER_IP=192.168.11.32
# 替换 apiserver.demo 为初始化 master 节点时所使用的 APISERVER_NAME
export APISERVER_NAME=apiserver.demo
echo "${MASTER_IP} ${APISERVER_NAME}" >> /etc/hosts

# 替换为 master 节点上 kubeadm token create 命令的输出
kubeadm join apiserver.demo:6443 --token vwfihu.3nhndohc5gn1jv9k --discovery-token-ca-cert-hash
sha256:22ff15cabfe87ab48a7db39b3bbf986fee92ec92eb8efc7fe9b0abe2175ff0c2
```

检查最终运行效果

- 在 master 节点上执行

```
# 只在 master 节点执行
kubectl get nodes -o wide
```

Ps: 如果出现NotReady的情况执行（最新版本的BUG，1.19一般没有）

```
docker pull quay.io/coreos/flannel:v0.10.0-amd64
mkdir -p /etc/cni/net.d/
cat <<EOF> /etc/cni/net.d/10-flannel.conf
{"name": "cbr0", "type": "flannel", "delegate": {"isDefaultGateway": true}}
EOF
mkdir /usr/share/oci-umount/oci-umount.d -p
mkdir /run/flannel/
cat <<EOF> /run/flannel/subnet.env
FLANNEL_NETWORK=172.100.0.0/16
FLANNEL_SUBNET=172.100.1.0/24
FLANNEL_MTU=1450
FLANNEL_IPMASQ=true
EOF
kubectl apply -f https://raw.githubusercontent.com/coreos/flannel/v0.9.1/Documentation/kube-flannel.yml
```

- 输出结果如下所示：

```
[root@k8smaster ~]# kubectl get nodes
```

### 搭建成功效果

NAME	STATUS	ROLES	AGE	VERSION
k8smaster	Ready	control-plane, master	13m	v1.22.3
k8sslave	Ready	<none>	84s	v1.22.3

安装Kuboard管理K8s集群

- 安装Kuboard

```
kubectl apply -f https://addons.kuboard.cn/kuboard/kuboard-v3.yaml
# 您也可以使用下面的指令，唯一的区别是，该指令使用华为云的镜像仓库替代 docker hub 分发 Kuboard 所需要的镜像
# kubectl apply -f https://addons.kuboard.cn/kuboard/kuboard-v3-swr.yaml
```

- 查看启动情况

```
watch kubectl get pods -n kuboard
```

### 查看效果

NAME	READY	STATUS	RESTARTS	AGE
kuboard-etcd-bbtrn	1/1	Running	0	2m45s
kuboard-v3-59ccddb94c-xvzd5	1/1	Running	0	2m45s

- 在浏览器中打开链接 <http://your-node-ip-address:30080>



- 输入初始用户名和密码，并登录

- 用户名: admin
- 密码: Kuboard123

## 10.4 Kubernetes操作

首先我们要了解Kubernetes在运行我们的资源时，关联到了哪些内容

- 资源的构建方式：

- 采用kubectl的命令方式
- yaml文件方式

### 10.4.1 Namespace

- 命名空间：主要是为了对Kubernetes中运行的资源进行隔离，但是网络是互通的，类似Docker的容器，可以将多个资源配置到一个NameSpace中。而NameSpace可以对不同环境进行资源隔离，默认情况下Kubernetes提供了default命名空间，在构建资源时，如果不指定资源，默认采用default资源。

命令方式：

```
# 查看现有的全部命名空间
kubectl get ns

# 构建命名空间
kubectl create ns 命名空间名称

# 删除现有命名空间，并且会删除空间下的全部资源
kubectl delete ns 命名空间名称
```

yaml文件方式：(构建资源时，设置命名空间)

```
apiVersion: v1
kind: Namespace
metadata:
  name: test
```

### 10.4.2 Pod

- Pod：Kubernetes运行的一组容器，Pod是Kubernetes的最小单位，但是对于Docker而言，Pod中会运行多个Docker容器
- 命令方式：

```
# 查看所有运行的pod
kubectl get pods -A

# 查看指定Namespace下的Pod
kubectl get pod [-n 命名空间] # (默认default)

# 创建Pod
kubectl run pod名称 --image=镜像名称
```

```

# 查看Pod详细信息
kubectl describe pod pod名称

# 删除pod
kubectl delete pod pod名称 [-n 命名空间] # (默认default)

# 查看pod输出的日志
kubectl logs -f pod名称

# 进去pod容器内部
kubectl exec -it pod名称 -- bash

# 查看kubernetes给Pod分配的ip信息，并且通过ip和容器的端口，可以直接访问
kubectl get pod -owide

```

- yaml方式 (推荐)

```

apiVersion: v1
kind: Pod
metadata:
  labels:
    run: 运行的pod名称
  name: pod名称
  namespace: 命名空间
spec:
  containers:
    - image: 镜像名称
      name: 容器名称

# 启动Pod: kubectl apply -f yaml文件名称
# 删除Pod: kubectl delete -f yaml文件名称

```

- Pod中运行多个容器

```

apiVersion: v1
kind: Pod
metadata:
  labels:
    run: 运行的pod名称
  name: pod名称
  namespace: 命名空间
spec:
  containers:
    - image: 镜像名称
      name: 容器名称
    - image: 镜像名称
      name: 容器名称
    .....

```

启动后可以查看到

The screenshot shows the Kuboard interface with the following details:

- Namespace:** test
- Pod Name:** nginx-tomcat
- Containers:**
  - nginx:** Status: running, Image: nginx, Port: 80, CPU: 0.1, Memory: 100M, Log: bash
  - tomcat:** Status: pending, Image: tomcat:8.5.68, Port: 80, CPU: 0.1, Memory: 100M, Log: bash
- Logs:** A log viewer is shown for the 'nginx' container, displaying recent log entries.
- Metrics:** CPU and memory usage metrics for both containers.

#### 10.4.3 Deployment

部署时，可以通过Deployment管理和编排Pod

Deployment部署实现

- 命令方式

```

# 基于Deployment启动容器
kubectl create deployment deployment名称 --image=镜像名称

# 用deployment启动的容器会在被删除后自动再次创建，达到故障漂移的效果

# 需要使用deploy的方式删除deploy
# 查看现在的deployment
kubectl get deployment

# 删除deployment
kubectl delete deployment deployment名称

# 基于Deployment启动容器并设置Pod集群数
kubectl create deployment deployment名称 --image=镜像名称 --replicas 集群个数

```

### • 配置文件方式

```

apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
  labels:
    app: nginx
spec:
  replicas: 3
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
        - name: nginx
          image: nginx
          ports:
            - containerPort: 80

```

正常使用kubectl运行yaml即可

### 弹性伸缩功能

```

# 基于scale实现弹性伸缩
kubectl scale deploy/Deployment名称 --replicas 集群个数

# 或者修改yaml文件
kubectl edit deploy Deployment名称

```

**图形化页面修改**

Reason	Time	Count	Message
Started	11分钟	1	Started container nginx
Created	11分钟	1	Created container nginx
Pulled	11分钟	1	Successfully pulled image "nginx" in 15.116375996s
Pulling	12分钟	1	Pulling image "nginx"
Scheduled	12分钟	1	Successfully assigned default/nginx-75ffc5c74b-rx9wl to kubernetes-worker

### 灰度发布

Deploy可以在部署新版本数据时，成功启动一个pod，才会下线一个老版本的Pod

```
kubectl set image deployment/Deployment名称 容器名=镜像:版本
```

### 10.4.4 Service

可以将多个Pod对外暴露一个Service，让客户端可以通过Service访问到这一组Pod，并且可以实现负载均衡

ClusterIP方式：

ClusterIP是集群内部Pod之间的访问方式

- 命令实现效果

```
# 通过生成service映射一个Deployment下的所有pod中的某一个端口的容器  
kubectl expose deployment Deployment名称 --port=Service端口号 --target-port=Pod内容器端口
```

之后通过 `kubectl get service` 查看Service提供的ip，即可访问

```
kubectl get service  
[root@kubernetes-master ~]# kubectl get service  
NAME      TYPE      CLUSTER-IP      EXTERNAL-IP      PORT(S)      AGE  
kubernetes  ClusterIP  10.96.0.1      <none>        443/TCP      22d  
nginx      ClusterIP  10.96.229.74    <none>        8888/TCP     7s  
[root@kubernetes-master ~]# curl 10.96.229.74:8888  
111  
[root@kubernetes-master ~]# curl 10.96.229.74:8888  
22222  
[root@kubernetes-master ~]# curl 10.96.229.74:8888  
22222  
[root@kubernetes-master ~]# curl 10.96.229.74:8888
```

也可以通过 Deployment名称, namespace名称, svc 作为域名访问

```
在服务容器内执行  
root@nginx-75ffc5c74b-m4rrw:/# curl nginx.default.svc:8888  
22222  
root@nginx-75ffc5c74b-m4rrw:/#  
root@nginx-75ffc5c74b-m4rrw:/# curl nginx.default.svc:8888  
22222  
root@nginx-75ffc5c74b-m4rrw:/#  
root@nginx-75ffc5c74b-m4rrw:/# curl nginx.default.svc:8888  
111
```

NodePort方式

ClusterIP的方式只能在Pod内部实现访问，但是一般需要对外暴露网关，所以需要NodePort的方式Pod外暴露访问

- 命令实现方式

```
# 通过生成service映射一个Deployment下的所有pod中的某一个端口的容器  
kubectl expose deployment Deployment名称 --port=Service端口号 --target-port=Pod内容器端口 --type=NodePort
```

```
查看Service效果  
[root@kubernetes-master ~]# kubectl expose deployment nginx --port=8888 --target-port=80 --type=NodePort  
service/nginx exposed  
[root@kubernetes-master ~]# kubectl get service  
NAME      TYPE      CLUSTER-IP      EXTERNAL-IP      PORT(S)      AGE  
kubernetes  ClusterIP  10.96.0.1      <none>        443/TCP      22d  
nginx      NodePort   10.96.121.126    <none>        8888:30717/TCP  6s      对外端口  
[root@kubernetes-master ~]#
```

← → C ⌂ ▲ 不安全 | 192.168.11.32:30717

111

Service也可以通过yaml文件实现

```
apiVersion: v1  
kind: Service  
metadata:  
  labels:  
    app: nginx  
  name: nginx  
spec:  
  selector:  
    app: nginx  
  ports:  
  - port: 8888  
    protocol: TCP  
    targetPort: 80
```

通过apply启动就也可以创建Service

## 测试效果-Deployment部署，通过Service暴露

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
  labels:
    app: nginx-deployment
spec:
  replicas: 2
  selector:
    matchLabels:
      app: nginx-deployment
  template:
    metadata:
      labels:
        app: nginx-deployment
    spec:
      containers:
        - name: nginx-deployment
          image: nginx
          ports:
            - containerPort: 80
---
apiVersion: v1
kind: Service
metadata:
  labels:
    app: nginx-service
  name: nginx-service
spec:
  selector:
    app: nginx-deployment
  ports:
    - port: 8888
      protocol: TCP
      targetPort: 80
  type: NodePort
```

可以看到暴露的信息

Service信息					
NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
kubernetes	ClusterIP	10.96.0.1	<none>	443/TCP	23d
nginx-service	NodePort	10.96.93.214	<none>	8888:30191/TCP	4h39m

### 10.4.5 Ingress

Kubernetes推荐将Ingress作为所有Service的入口，提供统一的入口，避免多个服务之间需要记录大量的IP或者域名，毕竟IP可能改变，服务太多域名记录不方便。

Ingress底层其实就是一个Nginx，可以在Kuboard上直接点击安装

Kuboard 安装

The screenshot shows the Kuboard interface for managing IngressClasses. On the left sidebar, 'IngressClass' is selected. The main area displays a table of existing IngressClasses, with one entry ('ingress') highlighted. A modal window titled '安装 IngressNginxController 并创建 IngressClass' is open, prompting for the name '名称' (Name) and specifying a private image repository. The '镜像' (Image) section includes a Docker command to pull the image from the repository. The '确定' (Confirm) button at the bottom right of the modal is highlighted with a red box.

因为副本数默认为1，但是k8s整体集群就2个节点，所以显示下面即为安装成功

安装成功

The screenshot shows the Kuboard interface after the IngressNginxController has been successfully installed. The main area displays a table of IngressNginxController instances, with four entries listed. The table includes columns for '名称' (Name), '就绪' (Ready), '所在节点' (Node), 'IP 地址' (IP Address), 'Phase' (Phase), '删除等待' (Delete Pending), '已重启' (Rebooted), and '已创建' (Created). The '已创建' column shows the creation time for each instance.

可以将Ingress接收到的请求转发到不同的Service中。

推荐使用yaml文件方式

```
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  name: nginx-ingress
spec:
  ingressClassName: ingress
  rules:
  - host: nginx.mashibing.com
    http:
      paths:
      - path: /
        pathType: Prefix
        backend:
          service:
            name: nginx-service
            port:
              number: 8888
```

## 启动时问题

```
[root@kubernetes-master ~]# vi nginx-ingress.yml
[root@kubernetes-master ~]# kubectl apply -f nginx-ingress.yml
Error from server (InternalError): error when creating "nginx-ingress.yml": Internal error occurred: failed calling webhook "validate.my-ingress-controller.ingress.kubernetes.io": Post "https://ingress-nginx-controller-admission-my-ingress-controller.ingress-nginx.svc:443/networking/v1/ingresses?timeout=10s": service "ingress-nginx-controller-admission-my-ingress-controller" not found
```

Kuboard安装的Ingress有admission的校验配置，需要先删除配置再启动

找到指定的Ingress的校验信息，删除即可

## 删除信息

```
[root@kubernetes-master ~]# kubectl get -A ValidatingWebhookConfiguration ①
NAME                      WEBHOOKS   AGE
ingress-nginx-admission-ingress   1        39m
ingress-nginx-admission-my-ingress-controller② 1        7d5h
[root@kubernetes-master ~]# kubectl delete ValidatingWebhookConfiguration ingress-nginx-admission-my-ingress-controller③
validatingwebhookconfiguration.admission.registration.k8s.io "ingress-nginx-admission-my-ingress-controller" deleted
[root@kubernetes-master ~]# kubectl apply -f nginx-ingress.yml
ingress.networking.k8s.io/nginx-ingress created
```

# 查看校验webhook的配置

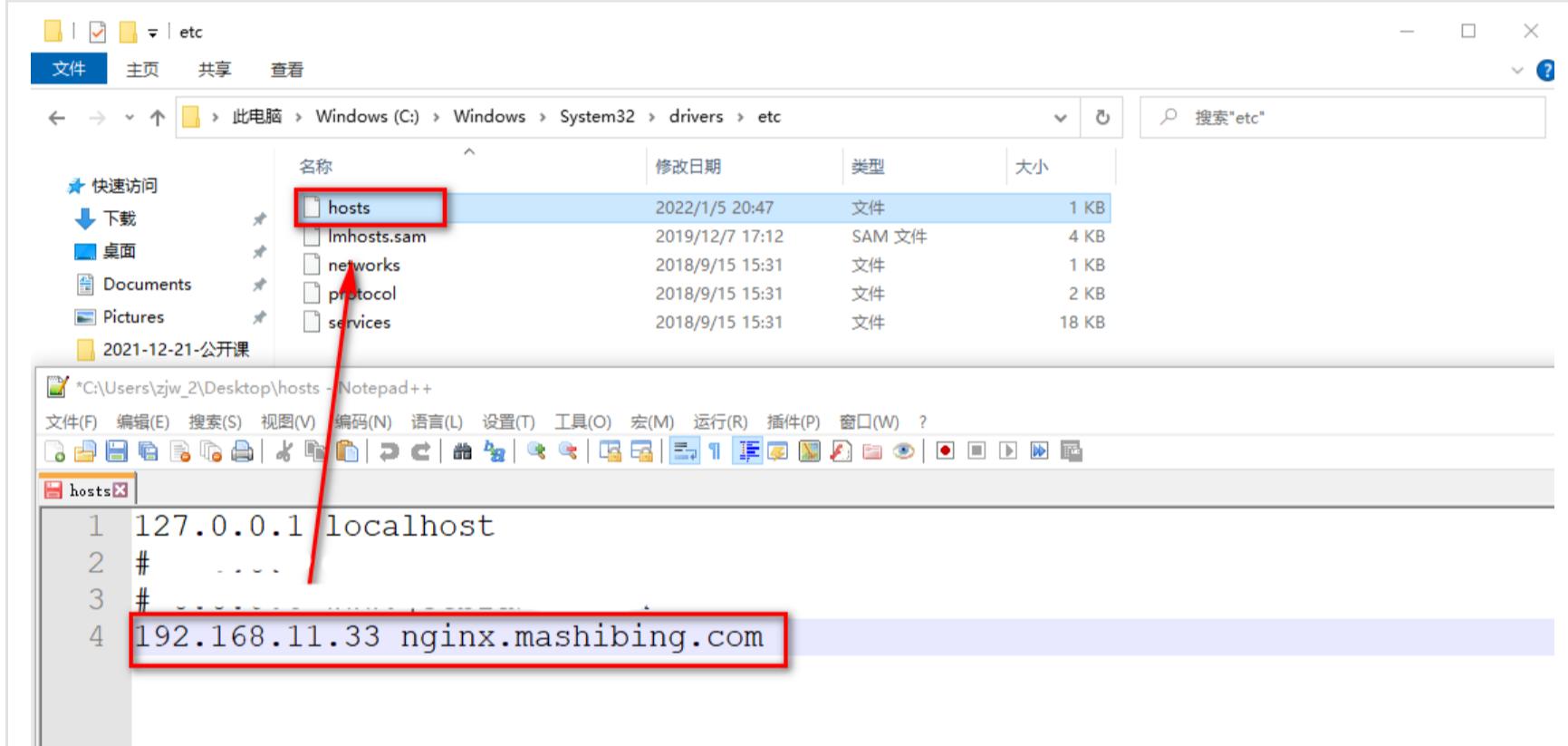
```
kubectl get -A ValidatingWebhookConfiguration
```

# 删除指定的校验

```
kubectl delete ValidatingWebhookConfiguration ingress-nginx-admission-my-ingress-controller
```

配置本地hosts文件

## 配置hosts



记下来既可以访问在Service中暴露的Nginx信息

## 通过Ingress访问

1111

## 10.5 Jenkins集成Kubernetes

### 10.5.1 准备部署的yml文件

```
apiVersion: apps/v1
kind: Deployment
metadata:
  namespace: test
  name: pipeline
  labels:
    app: pipeline
spec:
  replicas: 2
  selector:
    matchLabels:
```

```

app: pipeline
template:
  metadata:
    labels:
      app: pipeline
  spec:
    containers:
      - name: pipeline
        image: 192.168.11.102:80/repo/pipeline:v4.0.0
        imagePullPolicy: Always
      ports:
        - containerPort: 8080
---
apiVersion: v1
kind: Service
metadata:
  namespace: test
  labels:
    app: pipeline
  name: pipeline
spec:
  selector:
    app: pipeline
  ports:
    - port: 8081
      targetPort: 8080
      type: NodePort
---
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  namespace: test
  name: pipeline
spec:
  ingressClassName: ingress
  rules:
    - host: mashibing.pipeline.com
      http:
        paths:
          - path: /
            pathType: Prefix
            backend:
              service:
                name: pipeline
                port:
                  number: 8081

```

### 10.5.2 Harbor私服配置

在尝试用kubernetes的yml文件启动pipeline服务时，会出现Kubernetes无法拉取镜像的问题，这里需要在kubernetes所在的Linux中配置Harbor服务信息，并且保证Kubernetes可以拉取Harbor上的镜像

- 设置Master和Worker的私服地址信息

设置Harbor私服地址

```

[root@k8smaster ~]# cat /etc/docker/daemon.json ①
{
  "registry-mirrors": ["https://registry.cn-hangzhou.aliyuncs.com"],
  "insecure-registries": ["192.168.11.102:80"], ② 追加自己的harbor地址
  "exec-opts": ["native.cgroupdriver=systemd"],
  "log-driver": "json-file",
  "log-opt": {
    "max-size": "100m"
  },
  "storage-driver": "overlay2",
  "storage-opts": [
    "overlay2.override_kernel_check=true"
  ]
}
[root@k8smaster ~]# █

```

- 在Kuboard上设置私服密文信息

设置密文并测试

Kuboard

default

test

Secret: test / harbor

名称空间: test  
名称: harbor

类型: Docker 仓库密码  
数据:

- docker server: http://192.168.11.102:80
- docker username: admin
- docker password: \*\*\*\*\*

请在任意节点上执行如下命令,以确保信息填写正确,且节点能够正常登陆您的 docker 镜像仓库  
复制指令 复制指令后,粘贴板中的\*\*\*\*\*将被替换为您表单中填写的密码  
docker login 192.168.11.102:80/ -u admin -p \*\*\*\*\*

+ 创建 Secret

按照复制指令的位置测试认证, 效果如下

测试效果

```
[root@k8smaster ~]# docker login 192.168.11.102:80/ -u admin -p Harbor12345
WARNING! Using --password via the CLI is insecure. Use --password-stdin.
WARNING! Your password will be stored unencrypted in /root/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
[root@k8smaster ~]#
```

#### 10.5.3 测试使用效果

执行kubectl命令, 基于yml启动服务, 并且基于部署后服务的提示信息以及Ingress的设置, 直接访问

```
[root@k8smaster ~]# kubectl apply -f pipeline.yml
deployment.apps/pipeline created
service/pipeline created
ingress.networking.k8s.io/pipeline created
[root@k8smaster ~]#
```

#### 10.5.3 Jenkins远程调用

- 将pipeline.yml配置到Gitlab中

配置yaml文件

```

apiVersion: apps/v1
kind: Deployment
metadata:
  namespace: test
  name: pipeline
  labels:
    app: pipeline
spec:
  replicas: 2
  selector:
    matchLabels:
      app: pipeline
  template:
    metadata:
      labels:
        app: pipeline
    spec:
      containers:
        - name: pipeline
          image: 192.168.11.102:80/repo/pipeline:v4.0.0
          imagePullPolicy: Always
          ports:
            - containerPort: 8080
---
apiVersion: v1
kind: Service
  
```

Commit message: Create pipeline.yaml

Target Branch: master

Commit changes Cancel

- 配置Jenkins的目标服务器，可以将yaml文件传输到K8s的Master上



- 修改Jenkinsfile，重新设置流水线任务脚本，并测试效果

### 传递yml文件脚本

**Write Preview changes**

**P master Jenkinsfile**

```

36 |     stage('将自定义镜像推送到Harbor') {
37 |         steps {
38 |             sh '''docker login -u ${harborUser} -p ${harborPasswd} ${harborAddress}
39 | docker tag ${JOB_NAME}:${tag} ${harborAddress}/${harborRepo}/${JOB_NAME}:${tag}
40 | docker push ${harborAddress}/${harborRepo}/${JOB_NAME}:${tag} '''
41 |         }
42 |     }
43 |     stage('将yml文件传到k8s-master上') {
44 |         steps {
45 |             sshPublisher(publishers: [sshPublisherDesc(configName: 'k8s', transfers: [sshTransfer(cleanRemote: false, excludes: '',
execCommand: '', execTimeout: 120000, flatten: false, makeEmptyDirs: false, noDefaultExcludes: false, patternSeparator: '[, ]+', remoteDirectory: '',
remoteDirectorySDF: false, removePrefix: '', sourceFiles: 'pipeline.yml']), usePromotionTimestamp: false, useWorkspaceInPromotion: false,
verbose: false)])}
46 |         }
47 |     }

```

**Stage Logs (将yml文件传到k8s-master上)**

Send build artifacts over SSH (self time 217ms)

```

SSH: Connecting from host [68956a929abd]
SSH: Connecting with configuration [k8s] ...
SSH: Disconnecting configuration [k8s] ...
SSH: Transferred 1 file(s)

```

**阶段视图**

Declarative: Checkout SCM	拉取git仓库代码	通过maven构建项目	通过SonarQube做代码质量检测	通过Docker制作自定义镜像	将自定义镜像推送到Harbor	将yml文件传到k8s-master上	Declarative: Post Actions
287ms	228ms	7s	9s	1s	1s	273ms	4s
#32 Jan 17 18:17 23 commits	287ms	228ms	7s	9s	1s	1s	273ms

**相关链接**

- 最近一次构建(#32), 24毫秒之前

- 设置Jenkins无密码登录k8s-master

将Jenkins中公钥信息复制到k8s-master的`~/.ssh/authorized_keys`中，保证远程连接无密码

### 远程执行命令无需密码

```

jenkins@68956a929abd:~/ssh$ ssh root@192.168.11.201 asdasd1234312
bash: asdasd1234312: command not found
jenkins@68956a929abd:~/ssh$ 

```

- 设置执行kubectl的脚本到Jenkinsfile

### 设置Jenkinsfile

```

stage('将yml文件传到k8s-master上') {
    steps {
        sshPublisher(publishers: [sshPublisherDesc(configName: 'k8s', transfers: [sshTransfer(cleanRemote: false, excludes: '',
execCommand: '', execTimeout: 120000, flatten: false, makeEmptyDirs: false, noDefaultExcludes: false, patternSeparator: '[, ]+', remoteDirectory: '',
remoteDirectorySDF: false, removePrefix: '', sourceFiles: 'pipeline.yml')), usePromotionTimestamp: false, useWorkspaceInPromotion: false,
verbose: false)])
    }
}

stage('远程执行k8s-master的kubectl命令') {
    steps {
        sh 'ssh root@192.168.11.201 kubectl apply -f /usr/local/k8s/pipeline.yml'
    }
}

```

- 执行查看效果

### 执行流水线

**Stage Logs (远程执行k8s-master的kubectl命令)**

Shell Script -- ssh root@192.168.11.201 kubectl apply -f /usr/local/k8s/pipeline.yml (self time 10s)

```

+ ssh root@192.168.11.201 kubectl apply -f /usr/local/k8s/pipeline.yml
deployment.apps/pipeline configured
service/pipeline unchanged
ingress.networking.k8s.io/pipeline unchanged

```

**阶段视图**

Declarative: Checkout SCM	拉取git仓库代码	通过maven构建项目	通过SonarQube做代码质量检测	通过Docker制作自定义镜像	将自定义镜像推送到Harbor	将yml文件传到k8s-master上	远程执行k8s-master的kubectl命令	Declarative: Post Actions
308ms	207ms	6s	8s	1s	1s	213ms	10s	3s
#34 Jan 17 18:27 1 commit	287ms	205ms	7s	8s	1s	211ms	10s	4s

可以看到yml文件是由变化的，这样k8s就会重新加载

- 查看效果



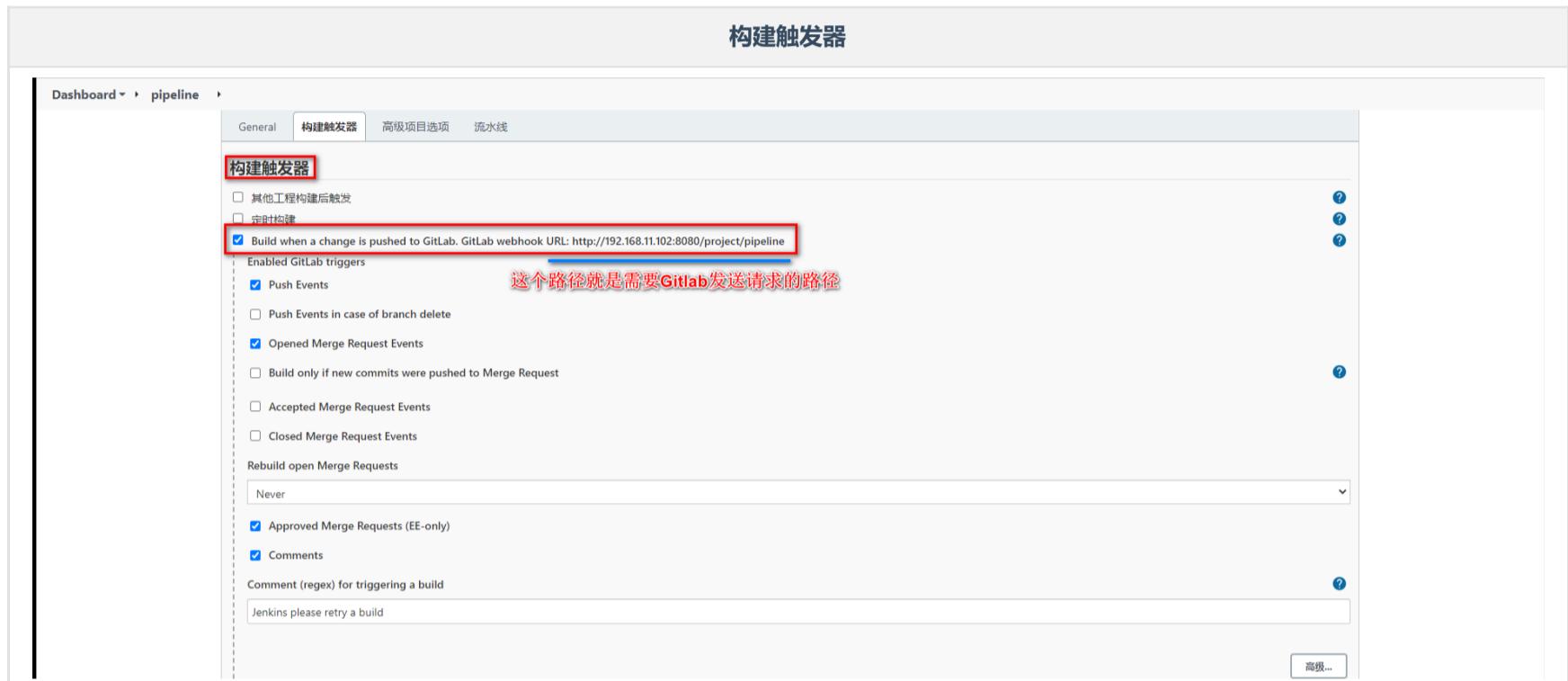
Ps: 这种方式更适应与CD操作，将项目将基于某个版本部署到指定的目标服务器

## 10.6 基于GitLab的WebHooks

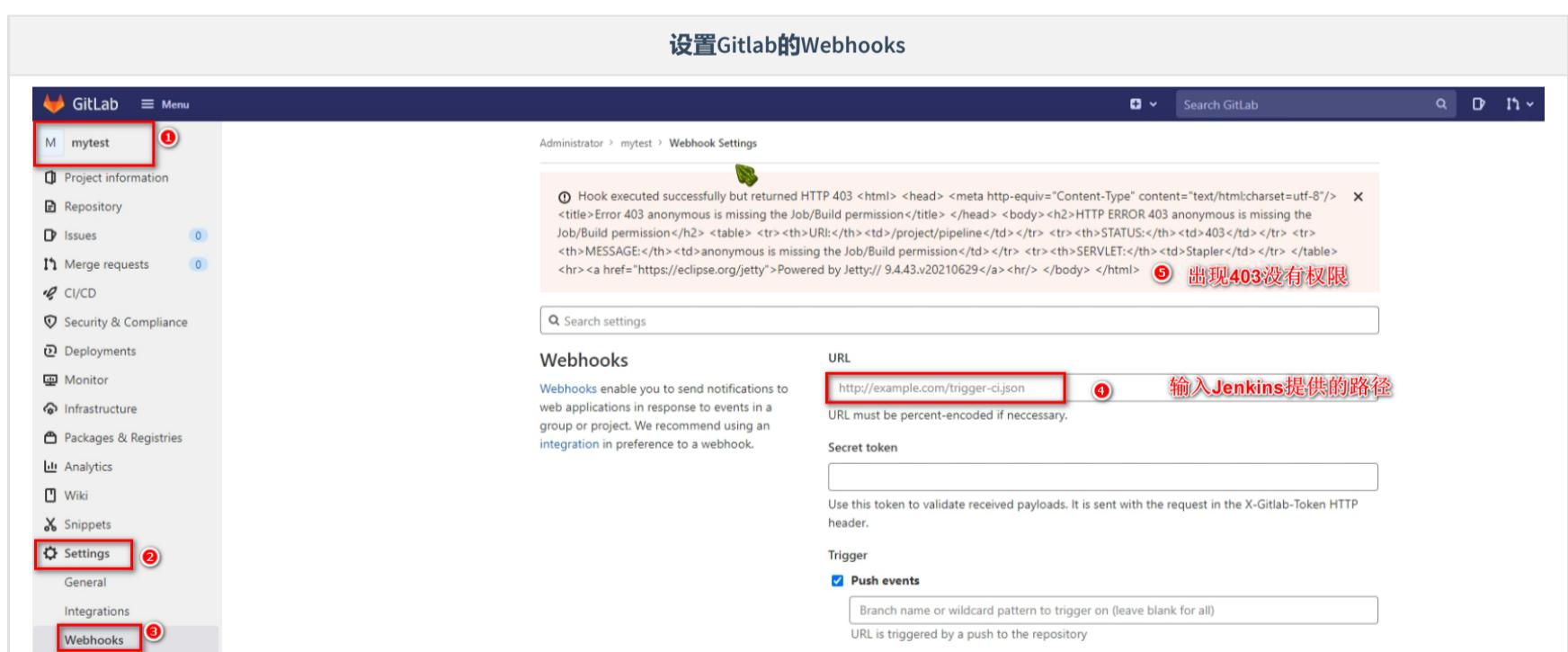
这里要实现自动化的一个CI操作，也就是开发人员Push代码到Git仓库后，Jenkins会自动的构建项目，将最新的提交点代码构建并进行打包部署，这里区别去上述的CD操作，CD操作需要基于某个版本进行部署，而这里每次都是将最新的提交点集成到主干上并测试。

### 10.6.1 WebHooks通知

开启Jenkins的自动构建



设置Gitlab的Webhooks



需要关闭Jenkins的Gitlab认证



## 再次测试Gitlab

The screenshot shows the 'Webhook Settings' page for a project named 'mytest'. A success message 'Hook executed successfully: HTTP 200' is displayed in a red-bordered box. The configuration includes a URL 'http://example.com/trigger-ci.json', a secret token field, and a trigger section with 'Push events' checked. A search bar at the top right is visible.

### 10.6.2 修改配置

修改Jenkinsfile实现基于最新提交点实现持续集成效果，将之前引用\${tag}的全部去掉

```
// 所有的脚本命令都放在pipeline中
pipeline{
    // 指定任务再哪个集群节点中执行
    agent any

    // 声明全局变量，方便后面使用
    environment {
        harborUser = 'admin'
        harborPasswd = 'Harbor12345'
        harborAddress = '192.168.11.102:80'
        harborRepo = 'repo'
    }

    stages {
        stage('拉取git仓库代码') {
            steps {
                checkout([$class: 'GitSCM', branches: [[name: '*/*']], extensions: [], userRemoteConfigs: [[url: 'http://192.168.11.101:8929/root/mytest.git']]])
            }
        }
        stage('通过maven构建项目') {
            steps {
                sh '/var/jenkins_home/maven/bin/mvn clean package -DskipTests'
            }
        }
        stage('通过SonarQube做代码质量检测') {
            steps {
                sh '/var/jenkins_home/sonar-scanner/bin/sonar-scanner -Dsonar.source=. / -Dsonar.projectname=${JOB_NAME} -Dsonar.projectKey=${JOB_NAME} -Dsonar.java.binaries=./target/ -Dsonar.login=40306ae8ea69a4792df2ceb4d9d25fe8a6ab1701'
            }
        }
        stage('通过Docker制作自定义镜像') {
            steps {
                sh '''mv ./target/*.jar ./docker/
                docker build -t ${JOB_NAME}:latest ./docker/'''
            }
        }
        stage('将自定义镜像推送到Harbor') {
            steps {
                sh '''docker login -u ${harborUser} -p ${harborPasswd} ${harborAddress}
                docker tag ${JOB_NAME}:latest ${harborAddress}/${harborRepo}/${JOB_NAME}:latest
                docker push ${harborAddress}/${harborRepo}/${JOB_NAME}:latest '''
            }
        }
        stage('将yaml文件传到k8s-master上') {
            steps {
                sshPublisher(publishers: [sshPublisherDesc(configName: 'k8s', transfers: [sshTransfer(cleanRemote: false, excludes: '', execCommand: '', execTimeout: 120000, flatten: false, makeEmptyDirs: false, noDefaultExcludes: false, patternSeparator: '[, ]+', remoteDirectory: '', remoteDirectorySDF: false, removePrefix: '', sourceFiles: 'pipeline.yml']), usePromotionTimestamp: false, useWorkspaceInPromotion: false, verbose: false)])
            }
        }
        stage('远程执行k8s-master的kubectl命令') {
            steps {
                sh '''ssh root@192.168.11.201 kubectl apply -f /usr/local/k8s/pipeline.yml
                ssh root@192.168.11.201 kubectl rollout restart deployment pipeline -n test'''
            }
        }
    }
}
```

```

        }

    }

    post {
        success {
            dingtalk(
                robot: 'Jenkins-DingDing',
                type: 'MARKDOWN',
                title: "success: ${JOB_NAME}",
                text: ["- 成功构建: ${JOB_NAME}! \n- 版本: latest \n- 持续时间: ${currentBuild.durationString}" ]
            )
        }
        failure {
            dingtalk(
                robot: 'Jenkins-DingDing',
                type: 'MARKDOWN',
                title: "success: ${JOB_NAME}",
                text: ["- 构建失败: ${JOB_NAME}! \n- 版本: latest \n- 持续时间: ${currentBuild.durationString}" ]
            )
        }
    }
}

```

修改pipeline.yml，更改镜像版本

```

apiVersion: apps/v1
kind: Deployment
metadata:
  namespace: test
  name: pipeline
  labels:
    app: pipeline
spec:
  replicas: 2
  selector:
    matchLabels:
      app: pipeline
  template:
    metadata:
      labels:
        app: pipeline
    spec:
      containers:
        - name: pipeline
          image: 192.168.11.102:80/repo/pipeline:latest  # 这里
          imagePullPolicy: Always
          ports:
            - containerPort: 8080
# 省略其他内容.....

```

### 10.6.3 滚动更新

因为pipeline没有改变时，每次不会重新加载，这样会导致Pod中的容器不会动态更新，这里需要使用kubectl的rollout restart命令滚动更新

**设置Jenkinsfile**

```

stage('远程执行k8s-master的kubectl命令') {
    steps {
        sh '''ssh root@192.168.11.201 kubectl apply -f /usr/local/k8s/pipeline.yml
        ssh root@192.168.11.201 kubectl rollout restart deployment pipeline -n test'''
    }
}

```

**追加滚动更新**

**Stage Logs (远程执行k8s-master的kubectl命令)**

```

+ ssh root@192.168.11.201 kubectl apply -f /usr/local/k8s/pipeline.yml
+ ssh root@192.168.11.201 kubectl rollout restart deployment pipeline -n test (self time 10s)
+ ssh root@192.168.11.201 kubectl rollout restart deployment pipeline -n test

```

**阶段视图**

Declarative: Checkout SCM	拉取git仓库代码	通过maven构建项目	通过SonarQube做代码质量检测	通过Docker制作自定义镜像	将自定义镜像推送到Harbor	将yaml文件传到k8s-master上	远程执行k8s-master的kubectl命令	Declarative: Post Actions
244ms	179ms	5s	7s	1s	1s	191ms	9s	4s

