

OpenShift 中 Jenkins 的工作方式选择

在 OpenShift 和 Jenkins 的配合中，有两个方式：共享 Jenkins 和独占 Jenkins。这也是我们在通过 OpenShift 实现 CI/CD 必须考虑的技术点。接下来，本节介绍 Jenkins 在 OpenShift 的两种工作的区别。

1. 共享 Jenkins 的介绍

OpenShift 默认情况下，在每个 Project 中第一次创建 Pipeline 都会自动运行一个 Jenkins 实例，那么有没有一种方法实现多个 Project 共用一个 Jenkins 或者整个 OpenShift 平台使用一个 Jenkins 呢？答案是肯定的。

为了便于描述，我们将 OpenShift 中多个 Project 共用的 Jenkins 称为共享 Jenkins。OpenShift 中实现共享 Jenkins 有两种方法：

方法一：在一个全局项目中部署 Jenkins，所有的 Pipeline 创建在该项目中。

方法二：在一个项目中创建 Jenkins，采集分布在不同 Project 中的 Pipeline。

在开始说明上述两种方法之前，先说明一点 Jenkins 相关的配置。因为共享 Jenkins 意味着 Jenkins 中 Jobs 会很多，需要配置更多的资源（CPU/MEM）来支撑 Job 运行，否则 Jenkins 经常会 OOM 错误退出。默认内存限制为 512M，建议将 JVM_ARCH 设置为 x86_64，内存限制设置为 4G 或者 8G，增加 MetaspaceSize（默认 100m）的大小。

通过在 Jenkins 的 DeploymentConfig 中增加环境变量

OPENSHIFT_JENKINS_JVM_ARCH=x86_64 来修改 JVM_ARCH，增加环境变量

JAVA_GC_OPTS="-XX:+UseParallelGC -XX:MinHeapFreeRatio=20 -XX:MaxHeapFreeRatio=40

-XX:GCTimeRatio=4 -XX:AdaptiveSizePolicyWeight=90 -XX:MaxMetaspaceSize=1024m" 设置

MetaspaceSize 大小。

2. 禁止默认行为

在实现共享 Jenkins 之前，先要禁用掉 OpenShift 的默认行为，也就是每个 Project 在第一次创建 Pipeline 的时候会自动创建一个 Jenkins 实例。

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从本章开始，我们进入“DevOps 转型三部曲”的探索部分。

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默认行为解析：OpenShift 在每个项目中，第一次创建 Pipeline 时，会检测当前项目中是否存在名为 Jenkins 的 service，如果不存在，则会在 openshift project 中查找名为 Jenkins-ephemeral 的 template，并在当前 Project 下实例化一个 Jenkins Server，关于 Jenkins-ephemeral 中的内容可查看模板的定义。

默认使用 OpenShift 项目下的 Jenkins-ephemeral 模版进行实例化 Jenkins，这样管理员就可以通过修改 Jenkins-ephemeral 模版来实现在 Jenkins 实例化中创建一些其他的资源对象。当然这种默认行为是可以定义的，通过在 Master 配置文件（/etc/origin/master/master-config.yaml）中设置如下参数：

```
JenkinsPipelineConfig:
  autoProvisionEnabled: true
  templateNamespace: openshift
  templateName: jenkins-ephemeral
  serviceName: jenkins
  parameters:
    key1: value1
    key2: value2
```

参数解释如下：

- autoProvisionEnabled: 默认为 true, 如果设置为 false，则表示不开启默认行为，第一次创建 Pipeline 时，不会实例化 Jenkins。
- templateNamespace: 实例化 Jenkins 使用的模版所在的 namespace，默认为 openshift。
- templateName: 实例化 Jenkins 所使用的模版名称，默认为 Jenkins-ephemeral。
- serviceName: 第一次创建 Pipeline 后检测 Jenkins service 的名称，在实例化 Jenkins 的模版中定义的 service 名称必须与该参数一致。
- parameters: 可以定义传入实例化 Jenkins 模版的参数，需要在模版中预先定义好。

使用上述参数管理员完全可以自定义默认行为或者禁用自动实例化 Jenkins 的行为。

实现共享 Jenkins 的前提是通过设置 autoProvisionEnabled=false 禁用每个 project 自动启动 Jenkins 实例的行为，其他参数保持默认即可。注意修改 Master 配置文件之后必须重启 Master 服务使得配置更改生效。

接下来，我们分别介绍共享 Jenkins 的两种实现方法。

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3. 方法一的实现

使用一个项目创建 Jenkins 实例, 将该项目设置为全局项目, 在该项目下创建所有的 Pipeline。

下面描述操作过程:

修改 Master 配置文件, 设置 autoProvisionEnabled=false

vi /etc/origin/master/master-config.yaml

```
.....
JenkinsPipelineConfig:
  autoProvisionEnabled: false
  templateNamespace: openshift
  templateName: jenkins-ephemeral
  serviceName: jenkins
```

重启 Master 服务

systemctl restart atomic-openshift-master

高可用 OpenShift 集群下, 在所有 Master 节点修改配置文件, 重启 atomic-openshift-master-api 服务。

创建一个项目, 并实例化 Jenkins:

oc login -u system:admin

oc new-project share-jenkins

实例化 Jenkins Server。可通过 Web Console 和命令行实现, 这里我们使用命令行

oc project share-jenkins

oc new-app --template=Jenkins-ephemeral --param=JVM_ARCH=x86_64

--param=MEMORY_LIMIT=4Gi -e JAVA_GC_OPTS="-XX:+UseParallelGC -XX:MinHeapFreeRatio=20 -XX:MaxHeapFreeRatio=40 -XX:GCTimeRatio=4 -XX:AdaptiveSizePolicyWeight=90 -XX:MaxMetaspaceSize=1024m"

具体实例化 Jenkins 的参数可根据需要设置, 或部署之后再次修改 DeploymentConfig 文件均可, 但必须保证创建的 Service 名称为 jenkins。

接下来, 设置项目为全局项目。首先设置用户可见性为全局。此操作目的是让所有需要使用 Jenkins 的用户都可以访问该项目, 通常是将特定的用户或组指定为项目的 view 或 edit。这里我们

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直接将所有认证用户赋予 view 权限，权限控制后续在 Jenkins 中实现。

```
# oc policy add-role-to-group view system:authenticated
```

然后设置 Jenkins 可操作其他项目。这种方式需要赋予 ServiceAccount jenkins 对其他所有项目有操作权限，因为该项目中的 Pipeline 要对其他项目执行操作。

如果项目数量相对固定，那么可以单独对这几个项目设置权限

```
# oc policy add-role-to-user edit system:serviceaccount:share-jenkins:jenkins -n [other project]
```

如果项目数量不固定，则可以设置为将 ServiceAccount jenkins 赋予 cluster-admin 的 role

```
# oadm policy add-cluster-role-to-user cluster-admin -z jenkins
```

创建测试 Pipeline。为了后续测试 Pipeline，我们创建两个 Pipeline，并实现简单操作其他项目。

创建测试项目 demo-dev 和 demo-uat

```
# oc project demo-dev
```

```
# oc project demo-uat
```

如果使用对单独项目赋权，则执行如下操作：

```
# oc policy add-role-to-user edit system:serviceaccount:share-jenkins:jenkins -n demo-dev
```

```
# oc policy add-role-to-user edit system:serviceaccount:share-jenkins:jenkins -n demo-uat
```

创建演示 Pipeline。创建两个 Pipeline，用于演示，分别操作 demo-dev 和 demo-uat 中的资源，实际应用中 Pipeline 根据具体的场景编写。

在 share-jenkins 项目中创建名为 dev-mariadb 的演示 Pipeline，内容如下：

```
node('maven') {
  def project name = 'demo-dev'

  stage('clean mariadb') {
    sh "oc project ${project name}"
    sh "oc delete dc,svc,secret -l app=mariadb-ephemeral -n ${project name}"
  }

  stage('create mariadb') {
    sh "oc new-app --template=mariadb-ephemeral -n ${project name}"
  }

  stage('complete') {
```

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```
    echo "deploy complate"
  }
}
```

同样在 share-jenkins 项目中创建名为 uat-mariadb 的演示 Pipeline，内容与 dev-mariadb 一致，只需要把 project name 设置为 demo-uat 即可。创建之后就可以在 Jenkins 中看到两个 Job，如图 5-48 所示：

S	W	Name ↓	上次成功	上次失败	上次持续时间
		OpenShift Sample	没有	无	无
		share-jenkins/dev-mariadb	没有	无	无
		share-jenkins/uat-mariadb	没有	无	无

图 5-48 查看 Jenkins 中的 Job

测试运行两个 Job，可以看到均能够正确运行，且分别在 demo-dev 和 demo-uat 项目中创建了 mariadb 的容器，如图 5-49 所示。

Back to Dashboard

Status

Changes

Full Stage View

Build History

2018-5-16 下午3:54

OpenShift Build demo-dev-test-mariadb-2

2018-5-16 下午3:53

OpenShift Build demo-dev-test-mariadb-1

Pipeline demo-dev/test-mariadb

项目名称: demo-dev-test-mariadb

Recent Changes

Stage View

Average stage times:

	clean mariadb	create mariadb	complete
2018-5-16 下午3:54	3s	1s	16ms
2018-5-16 下午3:53	3s	1s	14ms

图 5-49 查看 Jenkins 中的 Job

查看项目中创建的 Pod，如图 5-50 所示。

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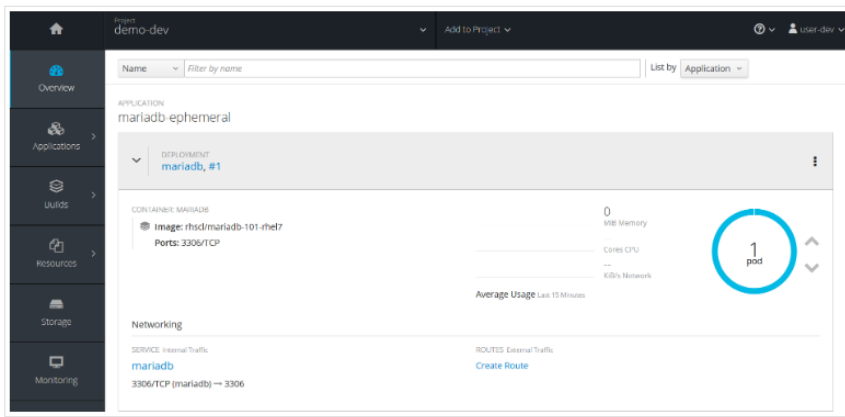


图 5-50 查看项目中创建的 Pod

可以看到这种方式已经实现了共享 Jenkins，但是默认 Jenkins 中的 Job，普通用户是没办法运行和编辑的，因为普通用户在该项目中被授予的是 view 权限。需要解决 Jenkins 中 Job 的权限问题。方法如下：

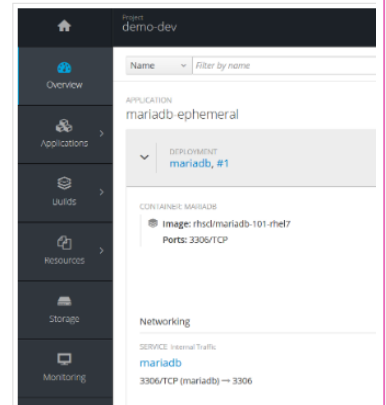
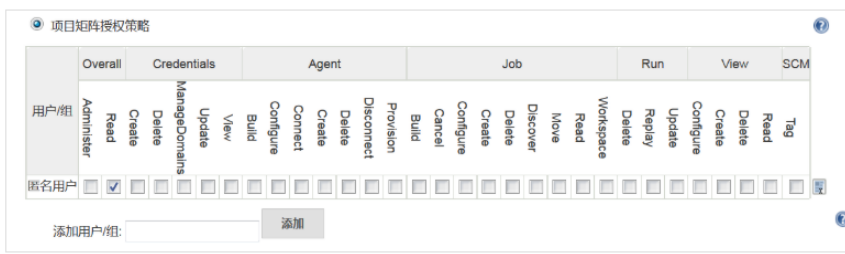
在 OpenShift 中增加测试用户。创建两个用于测试的用户 user-dev 和 user-uat

```
# httpsswd /etc/origin/master/httpsswd user-dev
```

```
# httpsswd /etc/origin/master/httpsswd user-uat
```

赋予 user-dev 对 project demo-dev 为 edit role，赋予 user-uat 对 project demo-uat 为 edit role；这样使用 user-dev 登录 OpenShift 后可以看到项目 demo-dev 和 share-jenkins，使用 user-uat 登录 OpenShift 后可以看到项目 demo-uat 和 share-jenkins，但是对 share-jenkins 项目只有 view 权限。

修改 Jenkins 权限为“项目矩阵授权策略”。使用管理员登录 Jenkins，进入“系统管理—Configure Global Security”，将授权策略设置为“项目矩阵授权策略”，并开启匿名用户的 overall/read 权限，如图 5-51 所示：



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可以看到这种方式已经实现了共享 Jenkins，但是默认 Jenkins 中的 job...ob，普通用户是没办法呢...行和编辑的，因为普通用户在该项目中被授予的是 view 权限。需要解决 Jenkins 中 job... [70]

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在 OpenShiftOCP

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赋予 user-dev 对 project demo-dev 为 edit role，赋予 user-uat 对 project demo-uat 为 edit role；这样使用 user-dev 登录 OpenShiftOCP...可以看到项目 demo-dev 和 share-jenkins，使用 user-uat 登录 OpenShiftOCP...可以看... [72]

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图 5-51 修改 Jenkins 权限

分别赋予 user-dev 和 user-uat 对应的 Job 权限。分别进入 Jenkins Job 中，设置 user-dev 对 job...ob dev-mariadb 有读写权限，如图 5-52 所示：

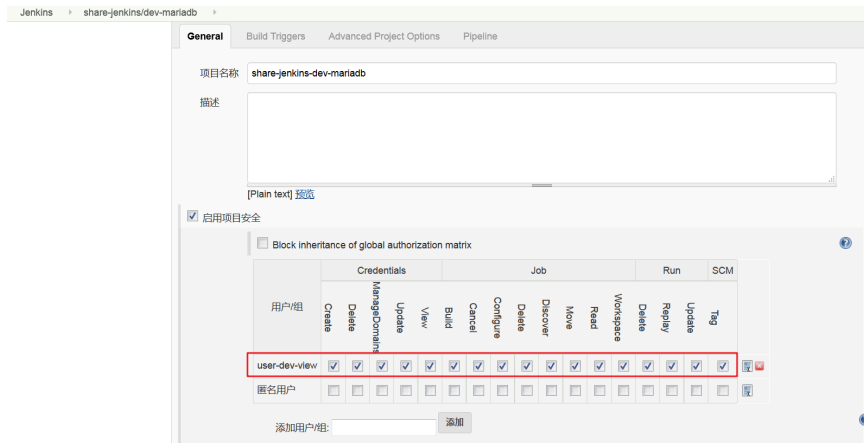


图 5-52 设置 user-dev 对 Job dev-mariadb 有读写权限

设置 user-uat 对 Job uat-mariadb 有读写权限，如图 5-53 所示：

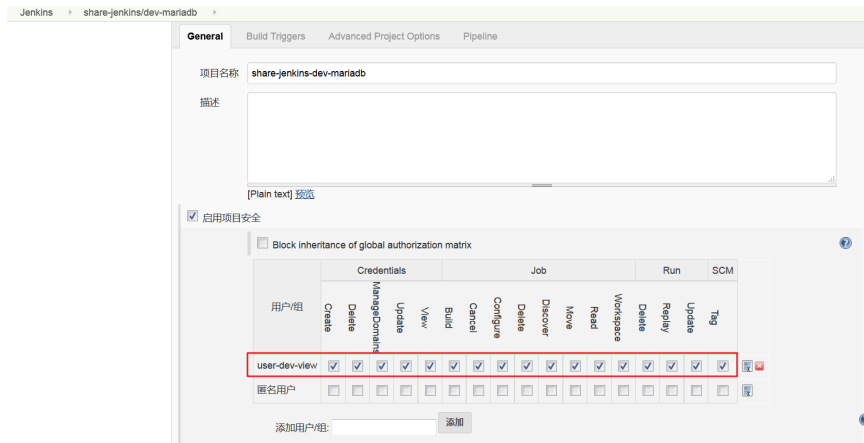


图 5-53 修改 Jenkins 中 user-uat-dev

分别登录用户测试。使用 user-dev 登录 Jenkins，可以看到 Jenkins 中所有的 Job，但是仅对 Job dev-mariadb 有构建和修改的权限，其余均为只读权限。用户 user-uat 也是类似的。如图 5-54、图 5-55、图 5-56 所示：

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分别赋予 user-dev 和 user-uat 对应的 job...ob 权限。分别进入 Jenkins job...ob 中，设置 user-dev 对 job...ob dev-mariadb 有读写权限，如下...



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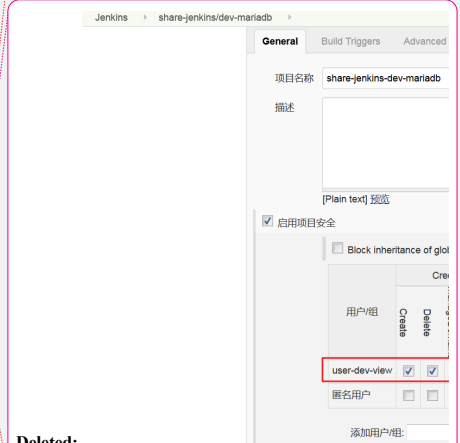
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分别登录用户测试。使用 user-dev 登录 Jenkins，可以看到 Jenkins 中所有的 job...ob，但是仅对 job...ob dev-mariadb 有构建和修改的权限，其余均为只读权限。用户 user-uat ... [75]

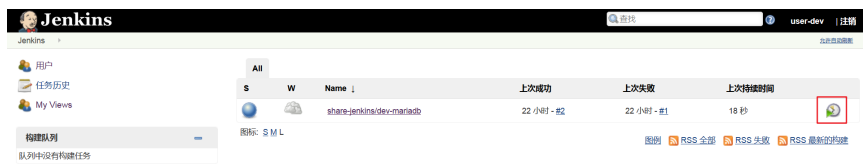


图 5-54 Jenkins 中查看权限

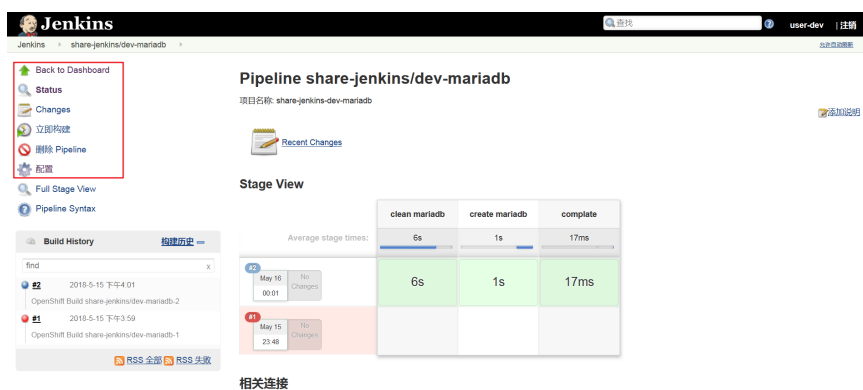


图 5-55 Jenkins 中查看权限

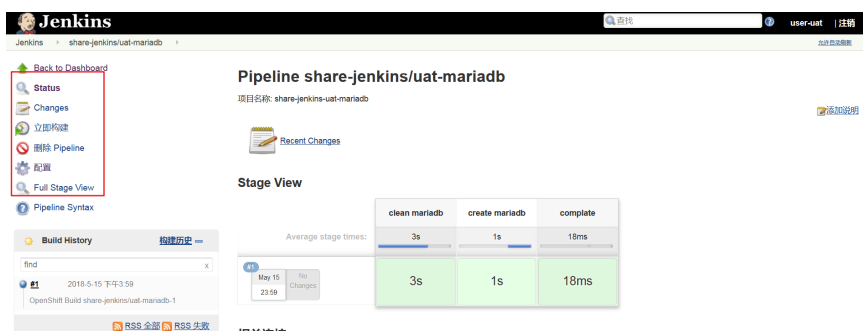


图 5-56 Jenkins 中查看权限

到此为止，已经完成了共享 Jenkins 的配置，这种方法的优缺点如下：

优点：

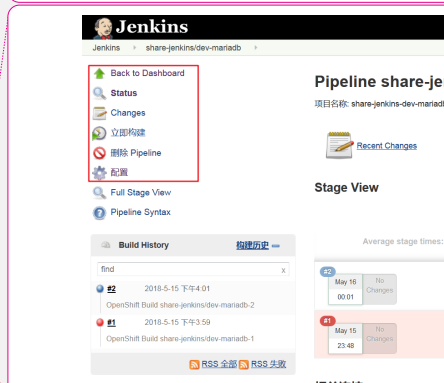
- 实现了 Jenkins Job 层面的权限控制。
- 实现和配置过程相对简单。
- 权限统一由 Jenkins 控制，简化了赋权操作。

缺点：

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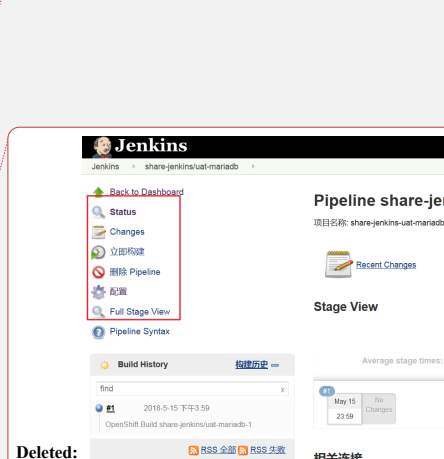
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- 所有 Pipeline 需要由管理员统一创建，增加管理员负担。
- 所有 Pipeline 在一个项目中，未做到 Pipeline 的隔离。

4. 方法二的实现

使用一个项目创建 Jenkins 实例，使用 Jenkins plugins——[OpenShift sync]

(<https://github.com/jenkinsci/openshift-sync-plugin>) 来同步不同 Project 中的 Pipeline。

下面描述操作过程，在操作之前先将方法一中环境删除避免冲突；

修改 Master 配置文件，设置 autoProvisionEnabled=false

vi /etc/origin/master/master-config.yaml

```
JenkinsPipelineConfig:
  autoProvisionEnabled: false
  templateNamespace: openshift
  templateName: jenkins-ephemeral
  serviceName: jenkins
```

重启 Master 服务

systemctl restart atomic-openshift-master

高可用 OpenShift 集群中，在所有 Master 节点修改配置文件，重启 atomic-openshift-master-api 服务。

创建一个项目，并实例化 Jenkins

创建名为 share-jenkins 的项目

oc login -u system:admin

oc new-project share-jenkins

实例化 Jenkins Server。可通过 Web Console 和命令行实现，这里我们使用命令行

oc project share-jenkins

oc new-app --template=jenkins-ephemeral --param=JVM_ARCH=x86_64

--param=MEMORY_LIMIT=4Gi -e JAVA_GC_OPTS="XX:+UseParallelGC -XX:MinHeapFreeRatio=20
-XX:MaxHeapFreeRatio=40 -XX:GCTimeRatio=4 -XX:AdaptiveSizePolicyWeight=90
-XX:MaxMetaspaceSize=1024m"

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具体实例化 Jenkins 的参数可根据需要设置,或部署之后再次修改 DeploymentConfig 文件均可,但必须保证创建的 Service 名称为 jenkins。

设置用户可见性为全局: 此操作目的是让所有需要使用 Jenkins 的用户都可以访问该项目, 通常是将特定的用户或组指定为项目的 view 或 edit。这里我们直接将所有认证用户赋予 view 权限, 权限控制后续在 jenkins 中实现。

```
# oc policy add-role-to-group view system:authenticated
```

设置 Jenkins 可操作其他项目。这种方式需要赋予 ServiceAccount jenkins 对其他所有项目有操作权限, 因为该项目中的 Pipeline 要对其他项目执行操作。

如果项目数量相对固定, 那么可以单独对这几个项目设置权限

```
# oc policy add-role-to-user edit system:serviceaccount:share-jenkins:jenkins -n [other project]
```

如果项目数量不固定, 则可以设置为将 ServiceAccount jenkins 赋予 cluster-admin 的 role

```
# oadm policy add-cluster-role-to-user cluster-admin -z jenkins
```

创建测试项目 demo-dev 和 demo-uat

```
# oc project demo-dev
```

```
# oc project demo-uat
```

分别设置 user-dev 和 user-uat 有项目 edit 权限

```
# oc policy add-role-to-user edit user-dev -n demo-dev
```

```
# oc policy add-role-to-user edit user-uat -n demo-uat
```

赋予 ServiceAccount jenkins 可操作权限

如果使用单独项目赋权, 则执行如下命令:

```
# oc policy add-role-to-user edit system:serviceaccount:share-jenkins:jenkins -n demo-dev
```

```
# oc policy add-role-to-user edit system:serviceaccount:share-jenkins:jenkins -n demo-uat
```

配置共享 Jenkins, 创建名为 jenkins 的 Service


根据 OpenShift 查找 Jenkins Server 的原理可知, 在项目中创建 Pipeline 时, 会查找名为 jenkins 的 Service, 所以我们手动创建 Service, 并使用 cname 将访问 Service 请求转发到 share-jenkins 项目中的 Jenkins Server。

使用如下 Service 定义文件创建名为 jenkins 的 Service。

```
cat > jenkins-svc.yaml << EOF
```

```
kind: "Service"
```

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Deleted: Jenkins:J ... [81]

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Deleted: pipeline

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apiVersion: "v1"

metadata:

name: "jenkins"

spec:

type: ExternalName

externalName: jenkins.share-jenkins.svc.cluster.local

selector: {}

>>EOF

分别在 demo-dev 和 demo-uat 中创建 Jenkins service

oc create -f jenkins-svc.yaml -n demo-dev

oc create -f jenkins-svc.yaml -n demo-uat

创建 Route

cat > jenkins-route.yaml << EOF

apiVersion: v1

kind: Route

metadata:

creationTimestamp: null

name: jenkins

spec:

host: jenkins-share-jenkins.apps.cloud.com

to:

kind: Service

name: jenkins

weight: 100

wildcardPolicy: None

status: {}

>>EOF

分别在 demo-dev 和 demo-uat 中创建 Jenkins route

oc create -f jenkins-route.yaml -n demo-dev

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oc create -f jenkins-route.yaml -n demo-uat

注意：必须创建 Route 对象，并将 hostname 指定为 share-jenkins 中对应的 Jenkins 域名，否则无法通过点击 view log 跳转到 Jenkins Server 中。因为此处 hostname 已被 share-jenkins 项目的 Jenkins Server 使用，所以 Web Console 中会出现如图 5-57 警告提示，忽略即可。

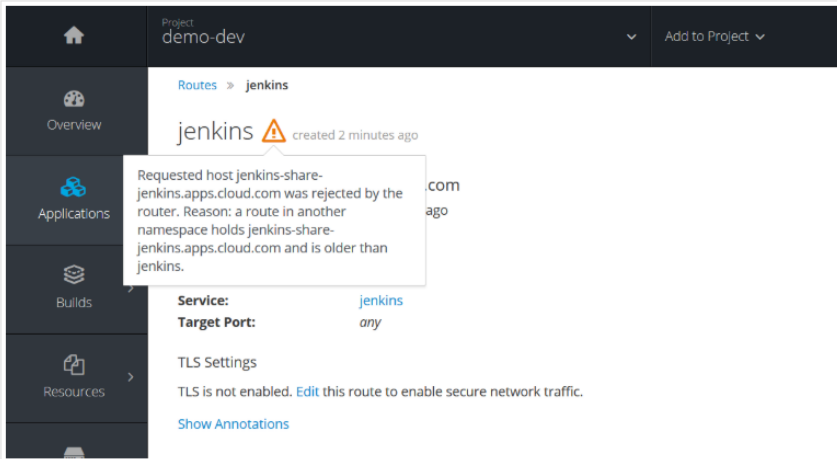


图 5-57 Jenkins 路由告警提示

配置 Jenkins Pipeline 同步插件。默认 OpenShift Jenkins Sync 的插件仅会同步当前 Project 的 Pipeline，我们手动在插件中添加需要同步的 Project。

使用管理员登录 Jenkins，切换到“系统管理—系统设置”，配置 OpenShift Jenkins Sync 插件，添加创建的演示项目 demo-dev 和 demo-uat，如图 5-58 所示：

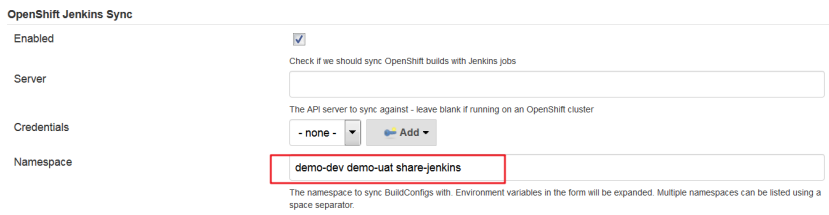


图 5-58 配置 OpenShift Jenkins Sync 插件

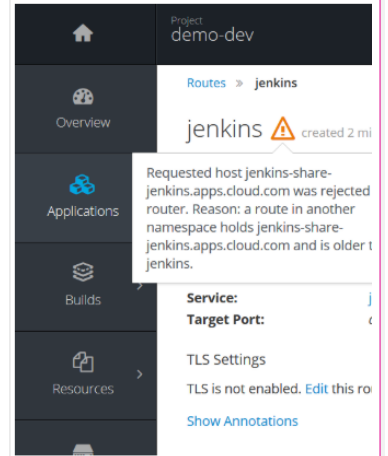
从图中可以看出，多个项目使用空格分隔。

创建演示 Pipeline。在 demo-dev 下创建 Pipeline，使用 user-dev 登录 OpenShift，在 demo-dev

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注意：必须创建 Route 对象，并将 hostname 指定为 ... [86]



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从图中可以看出如图所示

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项目下创建名为 test-mariadb 的演示 Pipeline，内容如下：

```
def project_name = 'demo-dev'

node('maven') {

    stage('clean mariadb') {

        sh "oc delete dc,svc,secret -l app=mariadb-ephemeral -n ${project_name}"

    }

    stage('create mariadb') {

        sh "oc new-app --template=mariadb-ephemeral -n ${project_name}"

    }

    stage('complate') {

        echo "deploy complate"

    }

}
```

在 demo-uat 下创建 Pipeline。同样使用 user-uat 登录 OpenShift，在 demo-uat 项目下创建名为 test-mariadb 的演示 Pipeline，内容与 demo-dev 中的基本一致，仅需要修改 project_name='demo-uat'。

创建完成之后，使用 user-dev 登录 Jenkins，可以看到所有 Pipeline 已经同步到 Jenkins Job 中了，如图 5-59 所示：

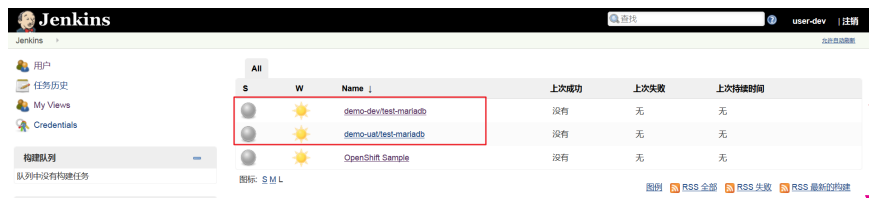


图 5-59 查看 Pipeline 已经同步

从图 5-59 可以看出，对 user-dev 对所有 Job 为只读权限，无法构建 Job。

需要注意的是 OpenShift Jnekins Sync 插件配置多个项目后，会有一定的延迟（同步周期为 5 分钟），请耐心等待数分钟。

以 user-dev 登录 OpenShift，在项目 demo-dev 中，切换到 Pipeline 界面，点击“start Pipeline”按钮，Pipeline 开始构建，并且状态同步到 Jenkins 中，如图 5-60 所示：

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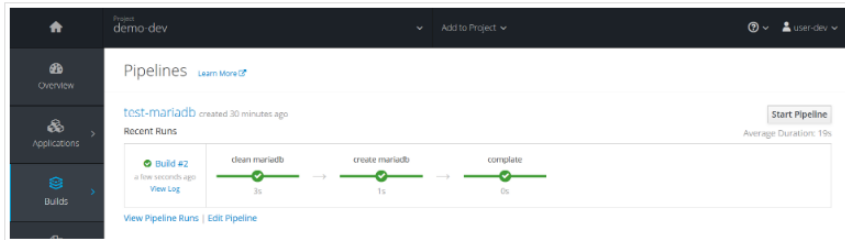


图 5-60 查看 demo-dev 项目中 Pipeline

查看状态同步到 Jenkins 中，如图 5-61 所示：

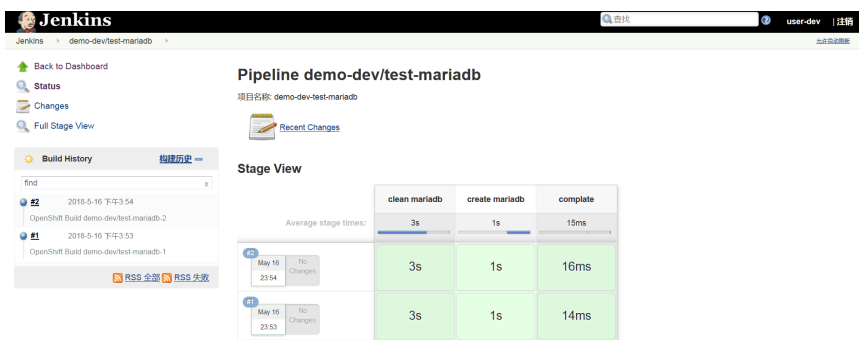


图 5-61 查看 Jenkins 中 Pipeline 状态

查看 demo-dev 中的 Pod 已经创建，如图 5-62 所示：

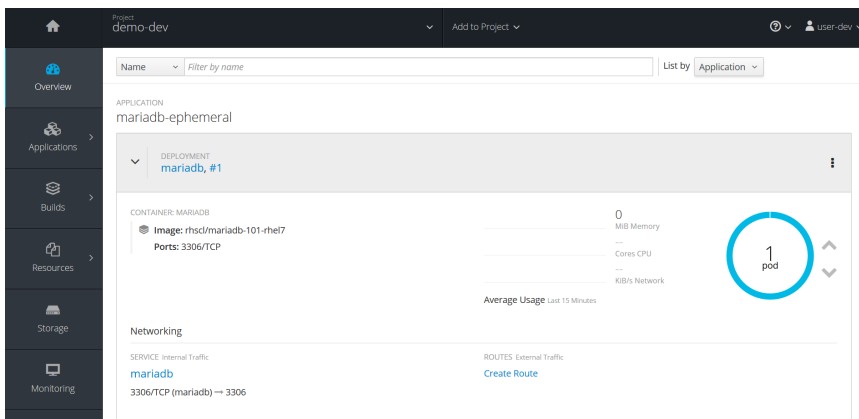
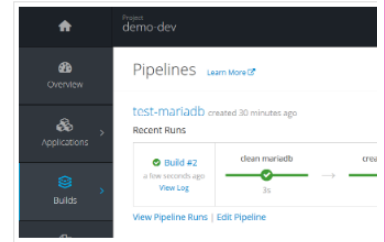


图 5-62 查看项目中 Pod

点击 Pipeline 中的“view log”按钮，可以正常的跳转到 share-jenkins 项目中的 Jenkins Server



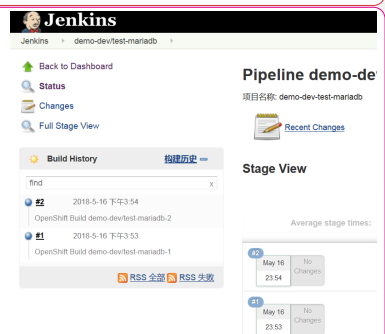
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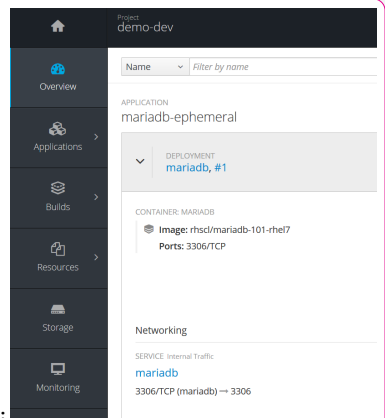
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... [101]

查看构建日志。如图 5-63 所示：



图 5-63 查看 Jenkins server 中日志

同样的可以使用 user-uat 登录测试。可以发现，user-uat 登录之后，同样在 Jenkins 中对 Job 只有只读权限。用户只可以在 OpenShift 中启动 Pipeline，修改 Pipeline 以及查看构建日志等。实际上，用户也完全没有对 Jenkins Job 有任何操作权限的必要。

另外在这种实现方法中，想要使用共享 Jenkins，每次新建一个 Project 就需要在 Project 中创建 Jenkins 的 Service 和 Route 对象，如果 Project 数目对固定，则手动创建即可，如果 Project 名称不固定，则可以使用 project-template 实现自动创建。

到此为止，已经完成了共享 Jenkins 的配置，这种方法的优缺点如下：

优点：

- 实现了 Pipeline 的隔离。
- 不同项目的 Pipeline 由用户自己创建维护，无需管理员参与。
- Jenkins 中所有 Job 为只读权限，安全性更高。

缺点：

- 实现和配置过程相对复杂。
- 在同步多个项目的 Pipeline 时，效率偏低，第一次同步延迟在分钟级别。

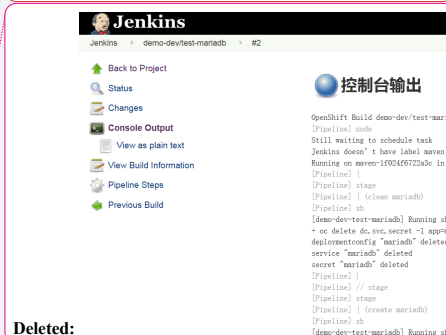
5. 方法一和方法二的对比

- 方法一中 Pipeline 构建权限由 Jenkins 控制，方法二中 Pipeline 构建权限由 OpenShift 控制
- 方法一无法做到 Pipeline 隔离，所有 Pipeline 均在同一个项目中；尽管在 Jenkins 中可以实现隔离，但是用户依然可以在 OpenShift 的项目中查看所有 Pipeline，但无法执行任何

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同样的可以使用 user-uat 登录测试。可以发现，user-uat 登录之后，同样在 Jenkins 中对 job...ob 只有只读权限。用户只可以在 OpenShiftOCP

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另外在这种实现方法中，想要使用共享 Jenkins，每次新建一个 Pp...oject 就需要在 Pp...oject 中创建 Jenkins 的

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- 操作。方法二完美的实现了 Pipeline 的隔离。
- 方法一所有的 Pipeline 首次必须由管理员创建模版，后续可以由用户自行在 Jenkins 中修改，而方法二 Pipeline 完全交由用户管理，交给用户自己管理就有可能出现乱用。
 - 方法一相对于方法二更健壮，在同步 Pipeline 上出错的可能性更小，主要由于 OpenShift Jenkins Sync 插件的不稳定性导致。

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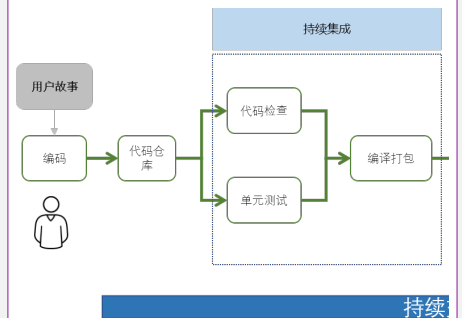
本节前面介绍了 OpenShift 上 5 种部署应用的方法，而且这不是全部的方法，但是面对这么多方法，实际应用中该如何选择合适的方法呢？ ¶

在本节开始的部分，我们介绍了选择最好的方式的一些标准，可以作为参考。不同的企业或团队认可的最好的方法可能不一致，这是由于团队现有的流程和人员水平等多方面因素决定的，没有必要要求完全一致，只有最适合团队协同工作的才是最好的方法。 ¶

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<#>在 OpenShift 上实现持续交付 ¶

持续交付通常指在开发人员提交新代码后，立即进行构建、（单元/集成）测试、最后发布到预生产环境，可以看到持续交付在 CI/CD 的基础上又进一步扩展，常见的持续交付流程如下图所示： ¶



图：5-4864 持续交付 ¶

DevOps 流程的核心实践是持续交付，本节将结合持续交付的具体实践，对 OpenShift 上实现持续交付展开分析和讨论。 ¶

<#>OpenShift 上 DevOps 持续交付工具介绍 ¶

持续交付的核心在于使用工具实现自动化，下面我们就先介绍在 OpenShift 上常用的实现持续交付的 DevOps 工具... [109] ¶

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