

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ  
РОССИЙСКОЙ ФЕДЕРАЦИИ  
федеральное государственное автономное  
образовательное учреждение высшего образования  
«Самарский национальный исследовательский университет  
имени академика С.П. Королева»  
(Самарский университет)

Институт информатики и кибернетики  
Кафедра технической кибернетики

**Отчет по лабораторной работе №4**

Дисциплина: «Развертывание и жизненный цикл программного обеспечения»

Тема: «**Building a CI/CD Pipeline. Kubernetes**»

Выполнил: Дубман Л.Б.

Группа: 6133-010402D

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## Задание

### Шаги:

1. Setup “minikube” or kubernetes cloud service.
2. Create `hello-app-deployment.yaml` file with hello-app docker image deployment to kubernetes
3. Add image deployment step into Jenkins pipeline through Ansible (if you want) or directly without Ansible
4. Create screenshot of successful finished pipeline of Jenkins window.

# Ход работы

## 1) Install kubectl:

```
ansible-admin@kubernetes-server: /opt/docker
ansible-admin@kubernetes-server:~$ curl -LO https://dl.k8s.io/release/`curl -LS https://dl.k8s.io/release/stable.txt`/bin/linux/amd64/kubectl
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           Dload  Upload   Total   Spent    Left     Speed
100 138    100 138    0    0    239    0 --:--:-- --:--:-- --:--:-- 240
100  7    100  7    0    0    6    0 0:00:01 0:00:01 --:--:-- 46
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           Dload  Upload   Total   Spent    Left     Speed
100 138    100 138    0    0    515    0 --:--:-- --:--:-- --:--:-- 518
100 47.5M 100 47.5M    0    0 6555k    0 0:00:07 0:00:07 --:--:-- 6742k
ansible-admin@kubernetes-server:~$ chmod +x ./kubectl
ansible-admin@kubernetes-server:~$ sudo mv ./kubectl /usr/local/bin/kubectl
```

## Check the version of kubectl:

```
ansible-admin@kubernetes-server:~$ kubectl version --output=yaml
clientVersion:
  buildDate: "2023-11-15T16:58:22Z"
  compiler: gc
  gitCommit: bae2c62678db2b5053817bc97181fcc2e8388103
  gitTreeState: clean
  gitVersion: v1.28.4
  goVersion: go1.20.11
  major: "1"
  minor: "28"
  platform: linux/amd64
kustomizeVersion: v5.0.4-0.20230601165947-6ce0bf390ce3
serverVersion:
  buildDate: "2023-10-18T11:33:18Z"
  compiler: gc
  gitCommit: a8a1abc25cad87333840cd7d54be2efaf31a3177
  gitTreeState: clean
  gitVersion: v1.28.3
  goVersion: go1.20.10
  major: "1"
  minor: "28"
  platform: linux/amd64
```

## 2) Install minikube and start, minikube tunnel:

```
ansible-admin@kubernetes-server:~$ curl -Lo minikube https://storage.googleapis.com/minikube/releases/latest/minikube-linux-amd64 \
&& chmod +x minikube
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           Dload  Upload   Total   Spent    Left     Speed
100 89.3M 100 89.3M    0    0 5377k    0 0:00:17 0:00:17 --:--:-- 7904k
ansible-admin@kubernetes-server:~$ sudo mkdir -p /usr/local/bin/
ansible-admin@kubernetes-server:~$ sudo install minikube /usr/local/bin/
```

```
ansible-admin@kubernetes-server: /opt/docker
ansible-admin@kubernetes-server:/opt/docker$ minikube start
minikube v1.32.0 на Debian 12.2 (vbox/amd64)
Используется драйвер docker на основе существующего профиля

The requested memory allocation of 1966MiB does not leave room for system overhead (total system memory: 1966MiB). You may face stability issues.
Предложение: Start minikube with less memory allocated: 'minikube start --memory=1966mb'

Запускается control plane узел minikube в кластере minikube
Скачивается базовый образ ...
Перезагружается существующий docker container для "minikube" ...
Подготавливается Kubernetes v1.28.3 на Docker 24.0.7 ...
Configuring bridge CNI (Container Networking Interface) ...
Компоненты Kubernetes проверяются ...
! Executing "docker container inspect minikube --format={{.State.Status}}" took an unusually long time: 12.710616065s
Restarting the docker service may improve performance.
  * Используется образ gcr.io/k8s-minikube/storage-provisioner:v5
Включенные дополнения: storage-provisioner, default-storageclass
Готово! kubect1 настроен для использования кластера "minikube" и "default" пространства имён по умолчанию
ansible-admin@kubernetes-server:/opt/docker$ minikube tunnel
! Executing "docker container inspect minikube --format={{.State.Status}}" took an unusually long time: 5.213243117s
Restarting the docker service may improve performance.

Status:
  machine: minikube
  pid: 9494
  route: 10.96.0.0/12 -> 192.168.49.2
  minikube: Running
  services: [hawon2013-hello-app-service]
  errors:
    minikube: no errors
    router: no errors
    loadbalancer emulator: no errors

^Z
[2]+  Остановлен    minikube tunnel
```

## Minikube status:

```
ansible-admin@kubernetes-server: ~
ansible-admin@kubernetes-server:~$ minikube status
! Executing "docker container inspect minikube --format={{.State.Status}}" took an unusually long time: 7.838842168s
Restarting the docker service may improve performance.

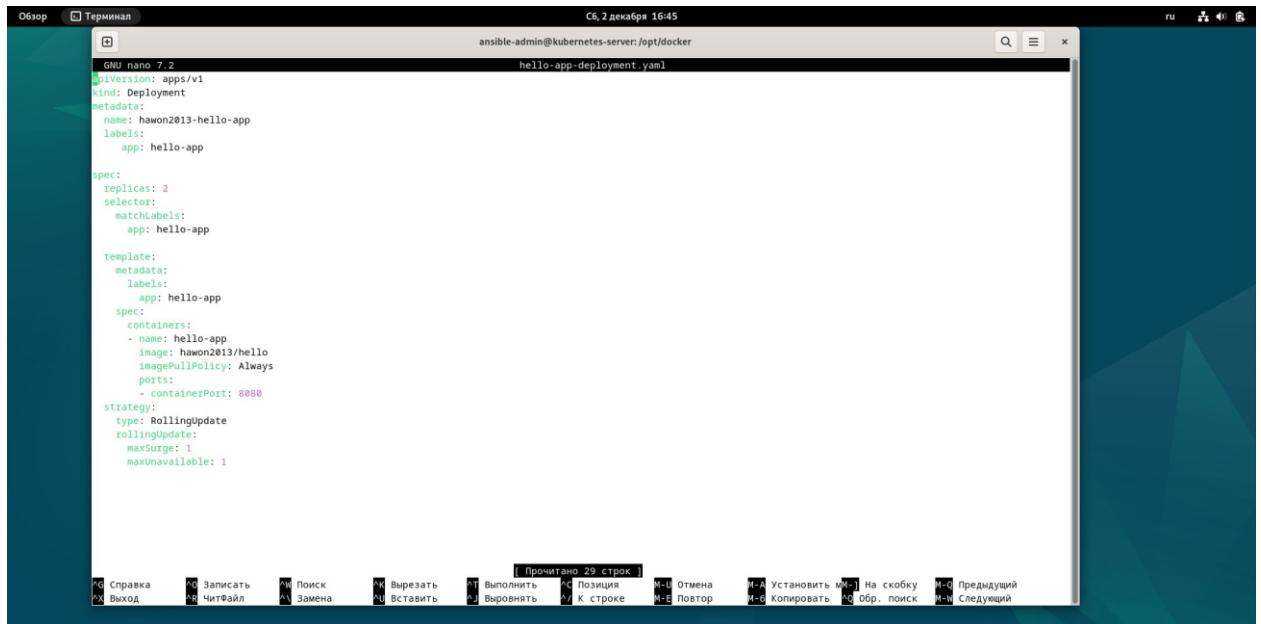
minikube
type: Control Plane
host: Running
kubelet: Running
apiserver: Running
kubeconfig: Configured
```

## 3) Create Kubernetes Deployment yaml file:

touch hello-app-deployment.yaml

nano hello-app-deployment.yaml

Inside to hello-app-deployment.yaml:



```
GNU nano 7.2
ansible-admin@kubernetes-server: /opt/docker
hello-app-deployment.yaml

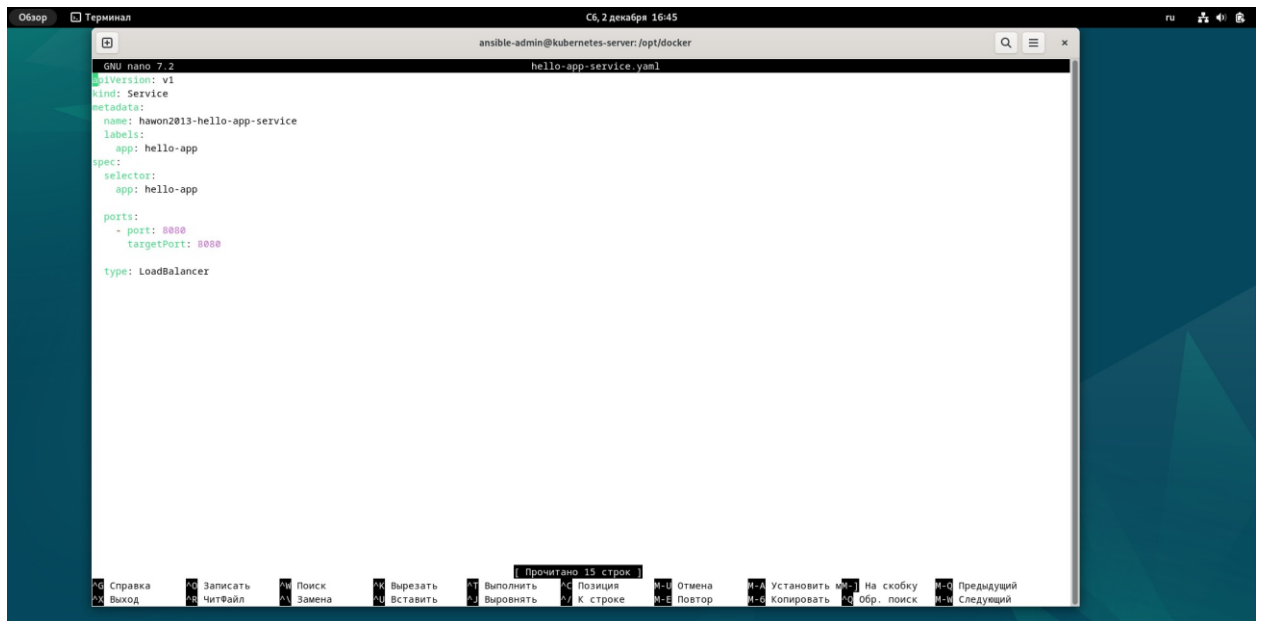
apiVersion: apps/v1
kind: Deployment
metadata:
  name: hawon2013-hello-app
  labels:
    app: hello-app
spec:
  replicas: 2
  selector:
    matchLabels:
      app: hello-app
  template:
    metadata:
      labels:
        app: hello-app
    spec:
      containers:
        - name: hello-app
          image: hawon2013/hello
          imagePullPolicy: Always
          ports:
            - containerPort: 8080
      strategy:
        type: RollingUpdate
        rollingUpdate:
          maxSurge: 1
          maxUnavailable: 1
```

#### 4) Create Kubernetes Service yaml file

touch hello-app-service.yaml

nano hello-app-service.yaml

Inside to hello-app-service.yaml:



```
GNU nano 7.2
ansible-admin@kubernetes-server: /opt/docker
hello-app-service.yaml

apiVersion: v1
kind: Service
metadata:
  name: hawon2013-hello-app-service
  labels:
    app: hello-app
spec:
  selector:
    app: hello-app
  ports:
    - port: 8080
      targetPort: 8080
  type: LoadBalancer
```

#### 5) Test Kubernetes cluster using kubectl



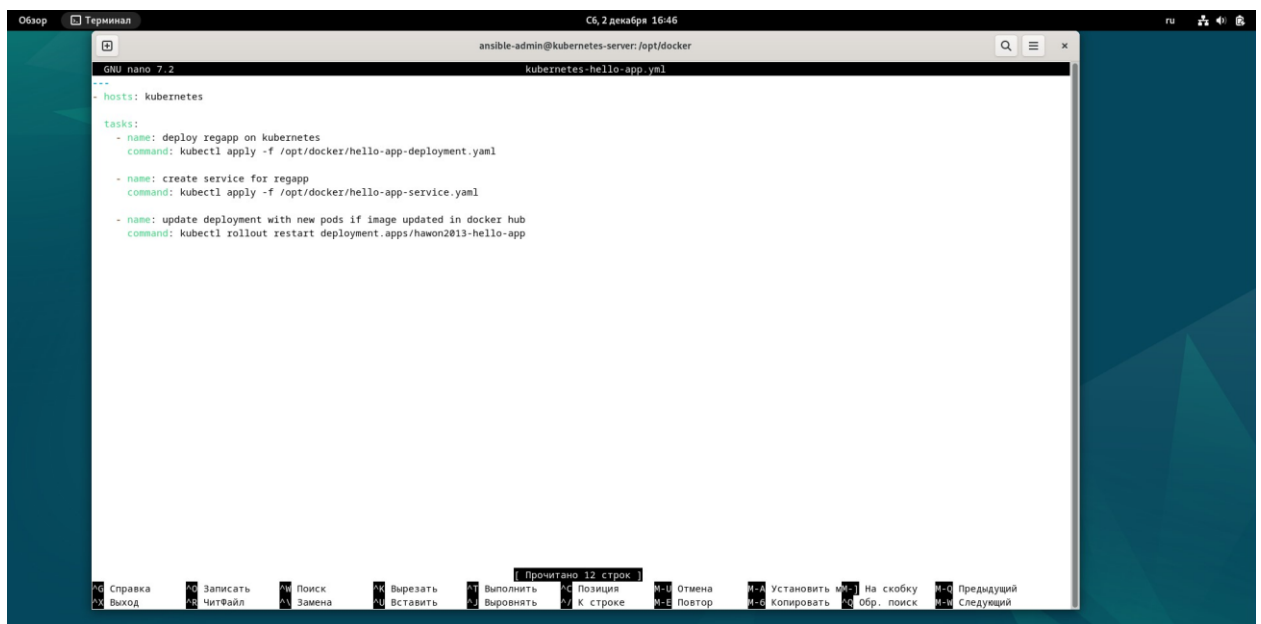
Delete All Deployments, Pods, Services

6) Create a new Ansible playbook for Kubernetes tasks

`touch kubernetes-hello-app.yml`

`nano kubernetes-hello-app.yml`

Inside to kubernetes-hello-app.yml:



7) Create ansible-playbook and screenshot successful build:

`sudo -u ansible-admin ansible-playbook /opt/docker/kubernetes-hello-app.yml`

```
терминал C6, 2 декабря 16:48
ansible-admin@kubernetes-server: ~
ansible-admin@kubernetes-server:~$ sudo -u ansible-admin ansible-playbook /opt/docker/kubernetes-hello-app.yml

PLAY [kubernetes] *****

TASK [Gathering Facts] *****
ok: [192.168.0.109]

TASK [deploy regapp on kubernetes] *****
changed: [192.168.0.109]

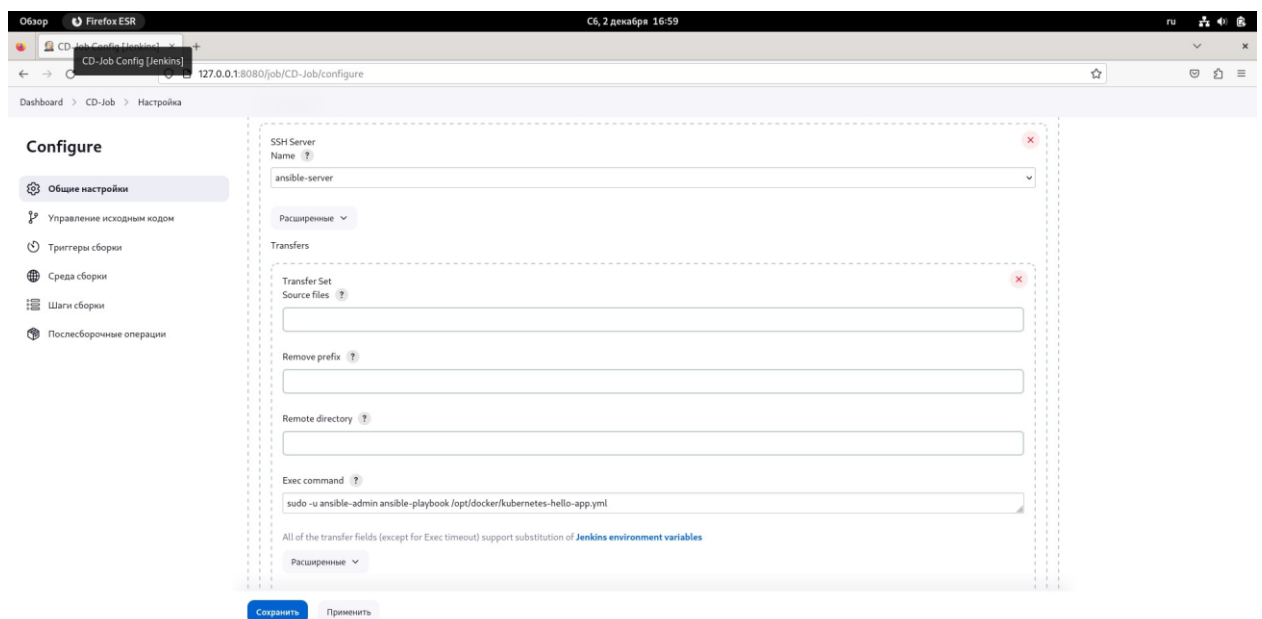
TASK [create service for regapp] *****
changed: [192.168.0.109]

TASK [update deployment with new pods if image updated in docker hub] *****
changed: [192.168.0.109]

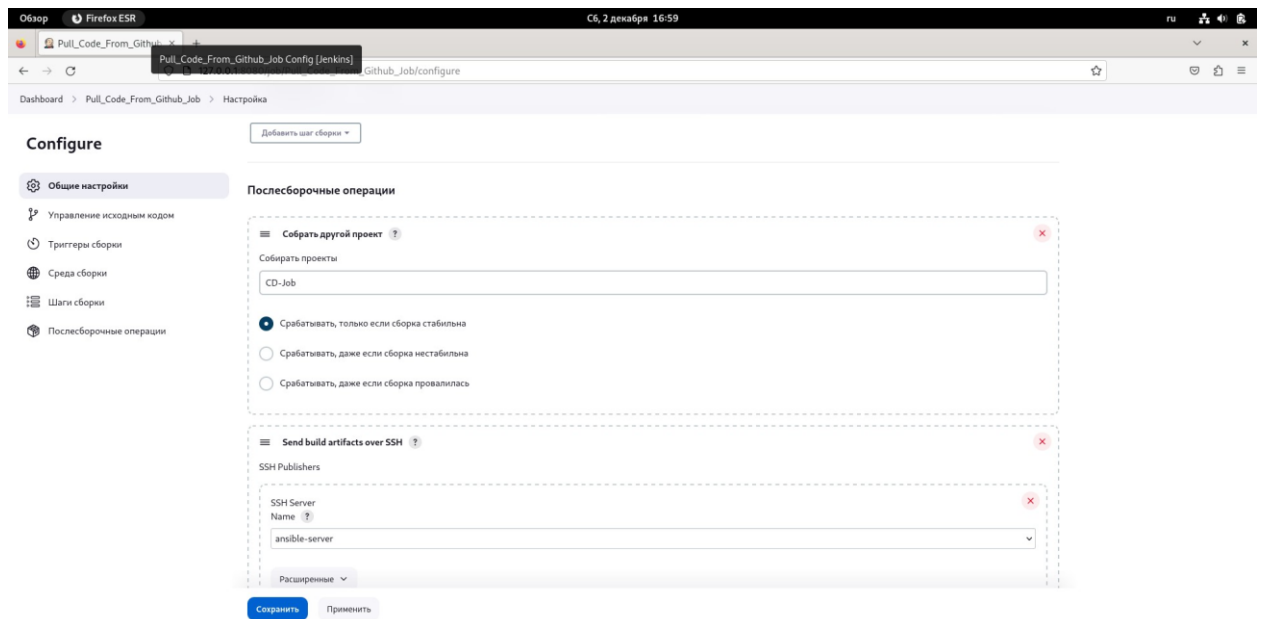
PLAY RECAP *****
192.168.0.109 : ok=4 changed=3 unreachable=0 failed=0 skipped=0 rescued=0 ignored=0
```

8) Integrate a new Ansible playbook for Kubernetes tasks with Jenkins

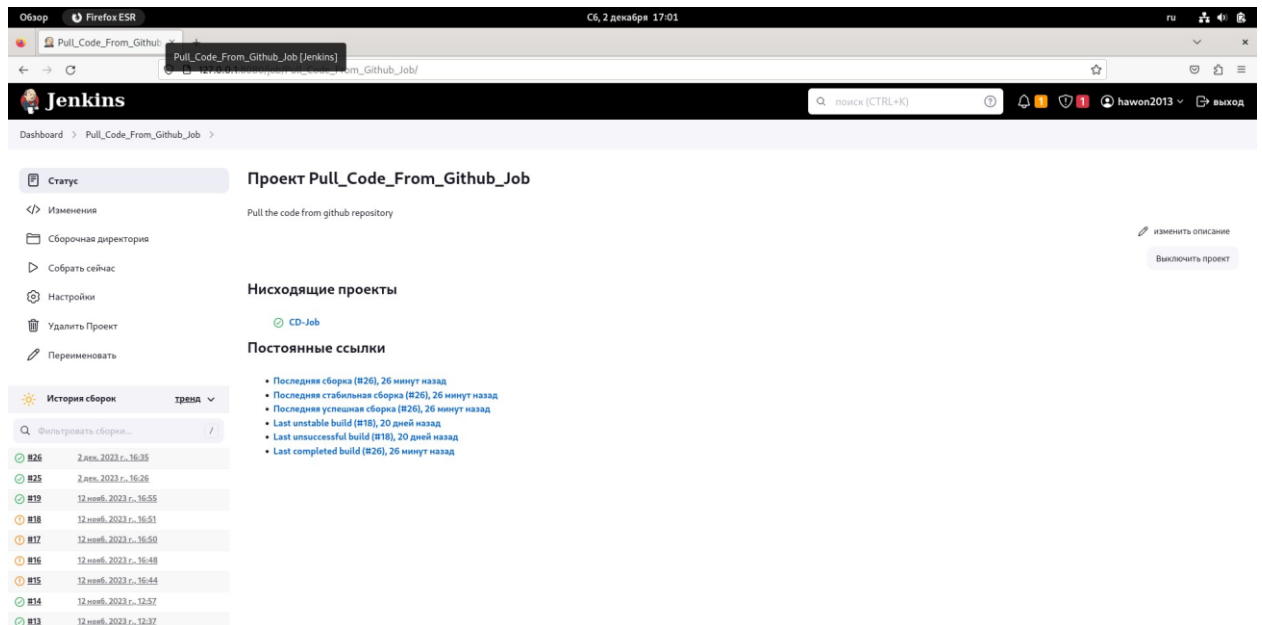
Creating new Jenkins Freestyle project with the name “CD-Job” and it configuring:



Configuring for Pull\_Code\_From\_Github\_Job:



## 9) Testing the Final Pipeline Version:





Обзор Firefox ESR 66, 2 декабря 17:00

ИнфоПанель [Jenkins] 127.0.0.1:8080

# Jenkins

Dashboard

Создать Item Пользователи История сборок Настроить Jenkins My Views

Очередь сборок

Очередь сборок пуста

Состояние сборщиков

1 В ожидании 2 В ожидании

S	W	Name	Последний успех	Последняя неудача	Последняя продолжительность
✓	☀	CD-Job	23 минут #1	Н/Д	20 секунд
✓	☀	Pull_Code_From_Github_Job	24 минут #26	Н/Д	1 минута 37 секунд

Значок: S M L

Помощь Atom feed for all Atom feed for failures Atom feed for just latest builds

REST API Jenkins 2.414.3

Обзор Firefox ESR 66, 2 декабря 16:37

Pull\_Code\_From\_Github: 127.0.0.1:8080/job/Pull\_Code\_From\_Github\_Job/26/

# Jenkins

Dashboard Pull\_Code\_From\_Github\_Job #26

Статус

Изменения

Вывод консоли

Редктировать информацию сборки

Delete build '#26'

Git Build Data

← Предыдущая сборка

## Сборка #26 (2 дек. 2023 г., 16:35:15)

Хранить эту сборку вечно

добавить описание

Запущена 1 минута 47 секунд назад  
Заняло: 1 минута 37 секунд

No changes.

Создана пользователем [hawon2013](#)

Revision: 63d7e898491b391c66659c1ada92b2dbd8d1b3ae  
Repository: [https://github.com/Sunagatov/Hello.git](https://github.com/Sunagatov>Hello.git)

• refs/remotes/origin/master

REST API Jenkins 2.414.3

Обзор Firefox ESR 66, 2 декабря 16:41

Pull\_Code\_From\_Github: 127.0.0.1:8080/job/Pull\_Code\_From\_Github\_Job/26/console

# Jenkins

Dashboard Pull\_Code\_From\_Github\_Job #26 Вывод на консоль

Статус

Изменения

Вывод консоли

Просмотреть как неформатированный текст

Редктировать информацию сборки

Delete build '#26'

Git Build Data

← Предыдущая сборка

## Вывод на консоль

```
Started by user hawon2013
Running as SYSTEM
Building in workspace /var/lib/jenkins/workspace/Pull_Code_From_Github_Job
The recommended git tool is: NONE
No credentials specified
> git rev-parse --resolve-git-dir /var/lib/jenkins/workspace/Pull_Code_From_Github_Job/.git # timeout=10
Fetching changes from the remote Git repository
> git config remote.origin.url https://github.com/Sunagatov/Hello.git # timeout=10
Fetching upstream changes from https://github.com/Sunagatov/Hello.git
> git --version # timeout=10
> git fetch --tags --force --progress -- https://github.com/Sunagatov/Hello.git +refs/heads/*:refs/remotes/origin/* # timeout=10
> git rev-parse refs/remotes/origin/master^{commit} # timeout=10
Checking out Revision 63d7e898491b391c66659c1ada92b2dbd8d1b3ae (refs/remotes/origin/master)
> git config core.sparsecheckout # timeout=10
> git checkout -f 63d7e898491b391c66659c1ada92b2dbd8d1b3ae # timeout=10
Commit message: "Merge pull request #1"
> git rev-list --no-walk 63d7e898491b391c66659c1ada92b2dbd8d1b3ae # timeout=10
[Pull_Code_From_Github_Job] $ /opt/apache-maven-3.9.4/bin/mvn -f pom.xml clean package
[INFO] Scanning for projects...
[INFO]
[INFO] -----< com.zufarexplainedit:hello >-----
[INFO] Building Hello 0.0.1-SNAPSHOT
[INFO] from pom.xml
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- clean:3.1.0:clean (default-clean) @ hello ---
[INFO] Deleting /var/lib/jenkins/workspace/Pull_Code_From_Github_Job/target
```

Firefox ESR C6, 2 декабря 16:41 ru

Pull\_Code\_From\_Github\_Job #26 Console [Jenkins]

Dashboard > Pull\_Code\_From\_Github\_Job > #26 > Вывод на консоль

```
[INFO] --- resources:3.2.0:testResources (default-testResources) @ hello ---
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] Using 'UTF-8' encoding to copy filtered properties files.
[INFO] skip non existing resourceDirectory /var/lib/jenkins/workspace/Pull_Code_From_Github_Job/src/test/resources
[INFO] --- compiler:3.8.1:testCompile (default-testCompile) @ hello ---
[INFO] No sources to compile
[INFO] --- surefire:2.22.2:test (default-test) @ hello ---
[INFO] No tests to run.
[INFO] --- jar:3.2.0:jar (default-jar) @ hello ---
[INFO] Building jar: /var/lib/jenkins/workspace/Pull_Code_From_Github_Job/target/hello-0.0.1-SNAPSHOT.jar
[INFO] --- spring-boot:2.5.4:repackage (repackage) @ hello ---
[INFO] Replacing main artifact with repackaged archive
[INFO] BUILD SUCCESS
[INFO] Total time: 45.383 s
[INFO] Finished at: 2023-12-02T16:36:28+04:00
SSH: Connecting from host [kubernetes-server]
SSH: Connecting with configuration [ansible-server] ...
SSH: EXEC: completed after 16 630 ms
SSH: Disconnecting configuration [ansible-server] ...
SSH: Transferred 1 file(s)
Инициализация новой сборки CD-Job
Finished: SUCCESS
```

REST API Jenkins 2.414.3

## 10) Getting external-ip and checking:

ansible-admin@kubernetes-server:~\$ kubectl get service hawon2013-hello-app-service

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
hawon2013-hello-app-service	LoadBalancer	10.104.97.248	10.104.97.248	8080:32520/TCP	4h53m

Firefox ESR C6, 2 декабря 16:54 ru

Pull\_Code\_From\_Github\_Job 10.104.97.248:8080/

10.104.97.248:8080

Hello World!