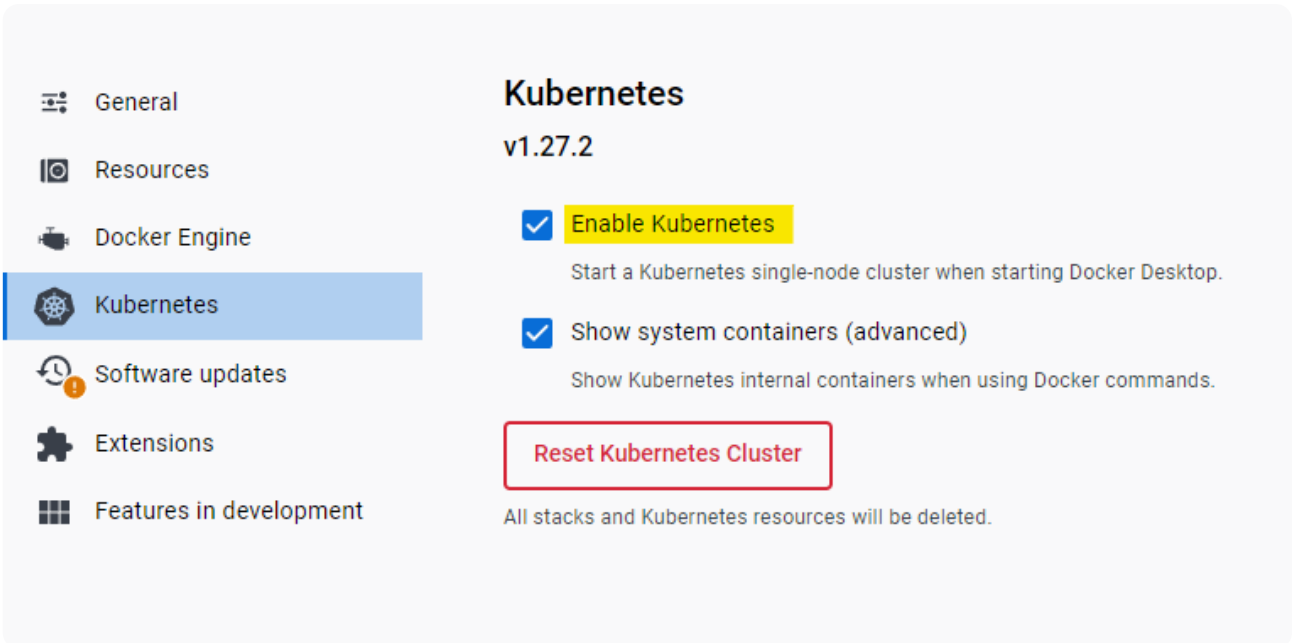


7. jenkins+Ansible+k8s 연동

1 . kubernetes 설치

- vm으로 설치할 경우 참고
- docker에서 minikube로 테스트 진행



2. k8s 기본 명령어

- 노드 확인
 - `kubectl get nodes`
- 파드 확인
 - `kubectl get pods`
 - `kubectl get pods -o wide`
- 디플로이먼트 확인
 - `kubectl get deployments`
- 서비스 확인
 - `kubectl get services`
- Nginx 서버 실행

- `kubectl run sample-nginx --image=nginx --port=80`
- 컨테이너 정보 확인
 - `kubectl describe pod/sample-nginx`
- 파드 삭제
 - `kubectl delete pod/sample-nginx-XXXXXX-XXXXXX`
- 디플로이먼트 생성
 - `kubectl create deployment sample-nginx --image=nginx`
- Scale 변경 (2개로 변경)
 - `kubectl scale deployment sample-nginx --replicas=2`
- Script 실행
 - `kubectl apply -f sample1.yml`

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
  labels:
    app: nginx
spec:
  replicas: 2
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
        - name: nginx
          image: nginx:1.14.2
          ports:
            - containerPort: 80
```

3. 동작 테스트

- 디플로이먼트 생성

- `kubectl create deployment sample-nginx --image=nginx`
- Scale 변경 (2개로 변경)
 - `kubectl scale deployment sample-nginx --replicas=2`

```
PS C:\Windows\system32> kubectl get pods
```

NAME	READY	STATUS	RESTARTS	AGE
sample-nginx-5d9d6f4fc4-2kswp	1/1	Running	0	68s
sample-nginx-5d9d6f4fc4-kt7w4	1/1	Running	0	104s

- pod에 터널링으로 접속
 - `kubectl exec -it sample-nginx-5d9d6f4fc4-2kswp -- /bin/bash`
- pod 내부에서 커맨드 설치
 - `apt update`
 - `apt install -y curl wget`
- pod의 nginx 동작 여부 확인

```
root@sample-nginx-5d9d6f4fc4-2kswp:/# hostname -i
10.1.0.14
```

```
root@sample-nginx-5d9d6f4fc4-2kswp:/# curl -X GET http://10.1.0.14
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed
and
working. Further configuration is required.</p>
```

```
<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

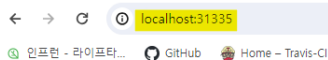
<p><em>Thank you for using nginx.</em></p>
</body>
</html>
```

- local에서 접근 가능하도록 포트 오픈
 - `kubectl expose deployment sample-nginx --port=80 --type=NodePort`
 - 아래 PORT 부분의 왼쪽 80이 Pod가 가진 포트, 오른쪽 31335이 windows 포트

```
$ kubectl expose deployment sample-nginx --port=80 --type=NodePort
service/sample-nginx exposed

$ kubectl get services
NAME                TYPE        CLUSTER-IP    EXTERNAL-IP    PORT(S)
AGE
kubernetes          ClusterIP   10.96.0.1     <none>         443/TCP
22h
sample-nginx        NodePort    10.109.4.200  <none>         80:31335/TCP
14s
```

- 접근 시 windows 포트로 접근
- localhost:31335



Welcome to nginx!

If you see this page, the nginx web server is successfully installed and working. Further configuration is required.

For online documentation and support please refer to nginx.org.
Commercial support is available at nginx.com.

Thank you for using nginx.

- 테스트 자원 삭제
 - `kubectl delete deployment sample-nginx`

- `kubectl.exe delete service/sample-nginx`

4. kubernetes script 파일

- 스크립트 생성

1. cicd-devops-deployment.yml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: cicd-deployment
spec:
  selector:
    matchLabels:
      app: cicd-devops-project
  replicas: 2

  template:
    metadata:
      labels:
        app: cicd-devops-project
    spec:
      containers:
        - name: cicd-devops-project
          image: edowon0623/cicd-project-ansible
          imagePullPolicy: Always
          ports:
            - containerPort: 8080
```

2. cicd-devops-service.yml

```
apiVersion: v1
kind: Service
metadata:
  name: cicd-service
  labels:
    app: cicd-devops-project
spec:
  selector:
```

```
  app: cicd-devops-project
  type: NodePort
  ports:
    - port: 8080
      targetPort: 8080
      nodePort: 32000
```

- 스크립트 실행 및 결과
 - `kubectl apply -f [스크립트 파일명]`

```
$ kubectl get deployment
```

NAME	READY	UP-TO-DATE	AVAILABLE	AGE
cicd-deployment	2/2	2	2	16s

```
$ kubectl get pod
```

NAME	READY	STATUS	RESTARTS	AGE
cicd-deployment-68f8594f94-pc6w8	1/1	Running	0	22s
cicd-deployment-68f8594f94-q6fqf	1/1	Running	0	22s

```
$ kubectl get services
```

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)
cicd-service	NodePort	10.96.174.15	<none>	8080:32000/TCP
kubernetes	ClusterIP	10.96.0.1	<none>	443/TCP

It's working on Tomcat server(9.0.65)

Hi, there

Have a nice day.

Today is 2023-09-27

Version: 3.0



5. Ansible에서 Kubernetes 제어

- 사전작업

- windows에 openssh-server 설치
- docker 엔진으로 기동하여 사용했던 ansible (172.17.0.3)에서 윈도우로 ssh 접근 테스트
 - `ssh hee@192.168.55.197` (windows ip)
 - `ssh-copy-id hee@192.168.55.197`

```
[root@ee81181ccfb4 ~]# ssh hee@192.168.55.197
The authenticity of host '192.168.55.197 (192.168.55.197)' can't be
established.
ECDSA key fingerprint is
SHA256:VxSsIEj6TBKL05dg98Kda0tomvj37sMkZ/ZpTllhg6s.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
```

```
Warning: Permanently added '192.168.55.197' (ECDSA) to the list of known hosts.
```

```
hee@192.168.55.197's password:
```

```
Microsoft Windows [Version 10.0.19045.3448]
```

```
(c) Microsoft Corporation. All rights reserved.
```

```
hee@DESKTOP-SATNHU9 C:\Users\hee>
```

- **ansible 서버에서 ansible 테스트**

1. ~/k8s/hosts* 디렉토리 및 파일 생성하여 아래 내용 저장

```
[ansible-server]  
localhost
```

```
[kubernetes]  
192.168.55.197
```

2. windows (kubernetes)로 ping test

```
ansible -i ./k8s/hosts kubernetes -m ping -u hee > 실행 실패
```

```
ansible -i /etc/ansible/hosts windows -m win_ping > 3) winrm 설정 후 성공
```

3. windows로 ssh-copy-id가 정상적으로 되지 않아서 문제 발생

- ansible-server에서 `yum install python39` 설치
- 설치 후 `pip install pywinrm`
- 아래 링크 참고하여 winrm 설정 진행
 - <https://shonm.tistory.com/635>
 - <https://www.infllearn.com/questions/666071/ansible-host-%EC%A0%91%EC%86%8D-%EA%B4%80%EB%A0%A8-%EB%AC%B8%EC%9D%98-%EB%93%9C%EB%A6%BD%EB%8B%88%EB%8B%A4>
- `url = "https://github.com/AlbanAndrieu/ansible-windows/blob/master/files/ConfigureRemotingForAnsible.ps1"`
`env : temp\ConfigureRemotingForAnsible.ps1(New-Object -TypeName System.IO.File, $url, $file)`
`powershell.exe -ExecutionPolicy Bypass -File $file`
`powershell.exe -ExecutionPolicy Bypass -File ConfigureRemotingForAnsible.ps1`
`Start-Service sshd`

- ansible 서버에 playbook 생성 (k8s-cicd-deployment-playbook.yml)

```
- name: Create pods using deployment
  hosts: kubernetes
  # become: true
  # user: ubuntu

  tasks:
    - name: delete the previous deployment
      command: kubectl delete deployment.apps/cicd-deployment

    - name: create a deployment
      command: kubectl apply -f cicd-devops-deployment.yml
```

k8s 설치 된 os가 windows 일 경우 win_command, 파일 경로 추가

```
- name: Create pods using deployment
  hosts: kubernetes
  # become: true
  # user: ubuntu

  tasks:
    - name: delete the previous deployment
      win_command: kubectl delete deployment.apps/cicd-deployment

    - name: create a deployment
      win_command: kubectl apply -f C:\Users\hee\cicd-devops-deployment.yml
```

- kubernetes(windows)에 스크립트 파일 생성

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: cicd-deployment
spec:
  selector:
    matchLabels:
      app: cicd-devops-project
  replicas: 2

  template:
```

```

metadata:
  labels:
    app: cicd-devops-project
spec:
  containers:
  - name: cicd-devops-project
    image: edowon0623/cicd-project-ansible
    imagePullPolicy: Always
    ports:
    - containerPort: 8080

```

- ansible서버에서 playbook 실행

```
- ansible-playbook -i ./k8s/hosts k8s-cicd-deployment-playbook.yml -u hee
```

```

[root@ee81181ccfb4 ~]# cat k8s-cicd-deployment-playbook.yml
- name: Create pods using deployment
  hosts: kubernetes
  # become: true
  # user: ubuntu

  tasks:
  - name: delete the previous deployment
    win_command: kubectl delete deployment.apps/cicd-deployment

  - name: create a deployment
    win_command: kubectl apply -f C:\Users\hee\cicd-devops-deployment.yml
[root@ee81181ccfb4 ~]#
[root@ee81181ccfb4 ~]#
[root@ee81181ccfb4 ~]#
[root@ee81181ccfb4 ~]# ansible-playbook -i ./k8s/hosts k8s-cicd-deployment-playbook.yml -u hee
[WARNING]: Invalid characters were found in group names but not replaced, use -vvvv to see details

PLAY [Create pods using deployment] *****

TASK [Gathering Facts] *****
ok: [192.168.55.197]

TASK [delete the previous deployment] *****
changed: [192.168.55.197]

TASK [create a deployment] *****
changed: [192.168.55.197]

PLAY RECAP *****
192.168.55.197      : ok=3    changed=2    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0

[root@ee81181ccfb4 ~]#

```

- kubernetes (windows) 결과 확인

```
> kubectl get all
```

NAME	READY	STATUS	RESTARTS	AGE
pod/cicd-deployment-68f8594f94-4kgwd	1/1	Running	0	5m55s
pod/cicd-deployment-68f8594f94-spjtd	1/1	Running	0	5m55s

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)
service/kubernetes	ClusterIP	10.96.0.1	<none>	443/TCP
AGE				
2d23h				

NAME	READY	UP-TO-DATE	AVAILABLE	AGE
deployment.apps/cicd-deployment	2/2	2	2	5m55s

NAME	DESIRED	CURRENT	READY
replicaset.apps/cicd-deployment-68f8594f94	2	2	2
AGE			
5m55s			

- ansible 서버에서 k8s service 생성용 playbook 추가 (k8s-cicd-service-playbook.yml)

```
- name: create service for deployment
  hosts: kubernetes
  # become: true
  # user: ubuntu

  tasks:
    - name: create a service
      command: kubectl apply -f cicd-devops-service.yml
```

k8s 설치 된 os가 windows 일 경우 win_command, 파일 경로 추가

```
- name: create service for deployment
  hosts: kubernetes
  # become: true
  # user: ubuntu

  tasks:
    - name: create a service
      win_command: kubectl apply -f C:\Users\hee\cicd-devops-service.yml
```

- kubernetes(windows)에 스크립트 파일 생성 (cicd-devops-service.yml)

```

apiVersion: v1
kind: Service
metadata:
  name: cicd-service
  labels:
    app: cicd-devops-project
spec:
  selector:
    app: cicd-devops-project
  type: NodePort
  ports:
    - port: 8080
      targetPort: 8080
      nodePort: 32000

```

- k8s service 생성용 playbook 실행

- `ansible-playbook -i ./k8s/hosts k8s-cicd-service-playbook.yml -u hee`

```

[root@ee81181ccfb4 ~]#
[root@ee81181ccfb4 ~]# cat k8s-cicd-service-playbook.yml
- name: create service for deployment
  hosts: kubernetes
  # become: true
  # user: ubuntu

  tasks:
    - name: create a service
      win_command: kubectl apply -f C:\Users\hee\cicd-devops-service.yml
[root@ee81181ccfb4 ~]#
[root@ee81181ccfb4 ~]#
[root@ee81181ccfb4 ~]# ansible-playbook -i ./k8s/hosts k8s-cicd-service-playbook.yml -u hee
[WARNING]: Invalid characters were found in group names but not replaced, use -vvvv to see details

PLAY [create service for deployment] *****

TASK [Gathering Facts] *****
ok: [192.168.55.197]

TASK [create a service] *****
changed: [192.168.55.197]

PLAY RECAP *****
192.168.55.197      : ok=2    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0

[root@ee81181ccfb4 ~]#
[root@ee81181ccfb4 ~]#

```

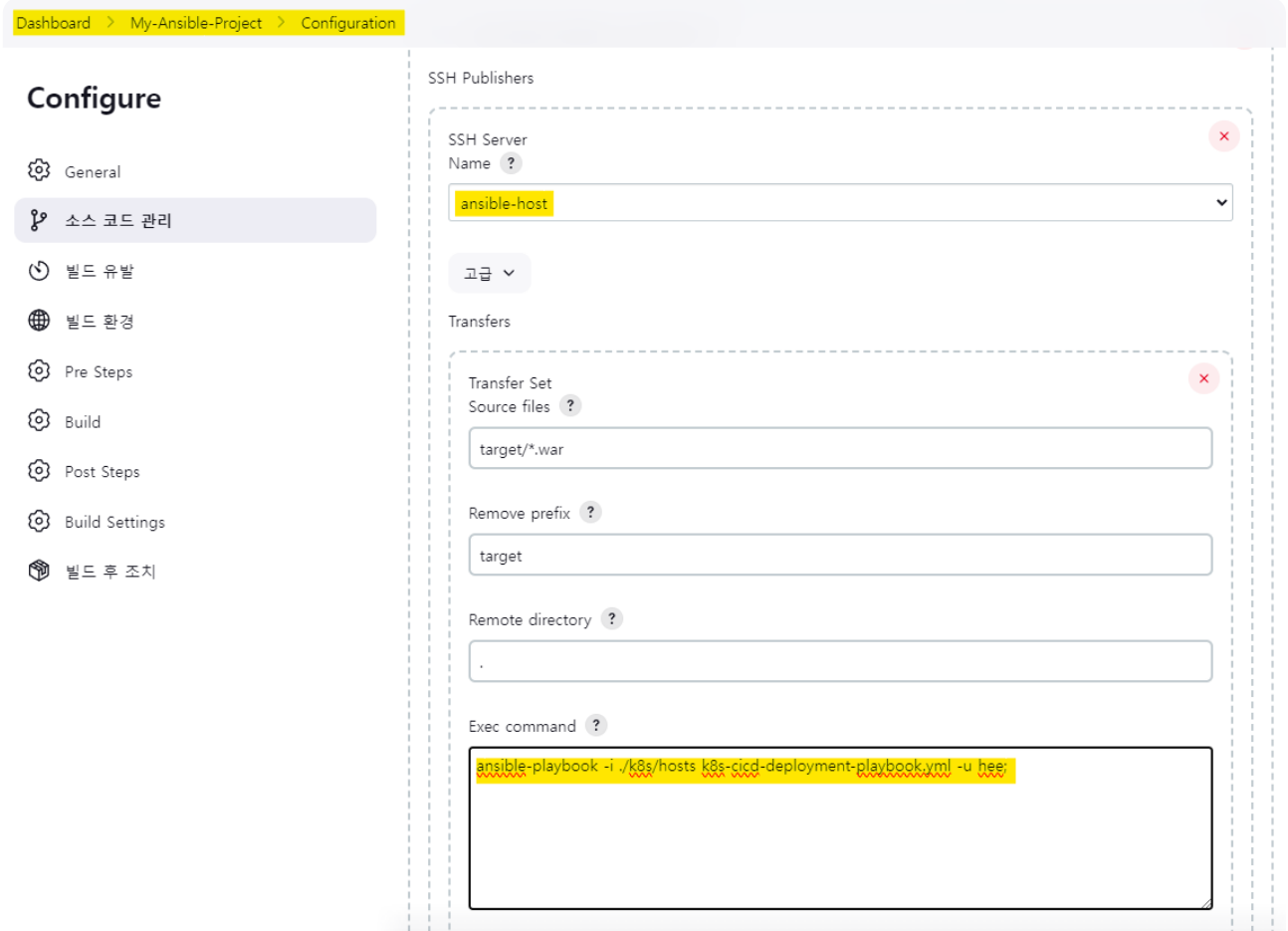
- kubernetes (windows) 결과 확인

```
> kubectl get services
```

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)
AGE				
cicd-service	NodePort	10.103.27.43	<none>	8080:32000/TCP
59s				
kubernetes	ClusterIP	10.96.0.1	<none>	443/TCP

6. jenkins까지 연동하기

- jenkins에서 ansible로 ssh 접속하여 playbook 실행
- playbook이 정상 실행되면 k8s(windows)에서 배포
- jenkins 설정 > Exec command 추가
 - `ansible-playbook -i ./k8s/hosts k8s-cicd-deployment-playbook.yml -u hee`
 - `ansible-playbook -i ./k8s/hosts k8s-cicd-service-playbook.yml -u hee`



- jenkins 빌드 진행 시 error 발생

```

SSH: Connecting from host [eb0201ac5fe0]
SSH: Connecting with configuration [ansible-host] ...
SSH: EXEC: completed after 5,204 ms
SSH: Disconnecting configuration [ansible-host] ...
ERROR: Exception when publishing, exception message [Exec exit status
not zero. Status [2]]
Build step 'Send build artifacts over SSH' changed build result to
UNSTABLE
Finished: UNSTABLE

```

// 기존 kubernetes 자원을 다 삭제하고 진행하여서 playbook 스크립트 내 자원 delete 부분에서 실패하여 에러가 발생하였음.

- ansible playbook 스크립트에 ignore_errors 설정 추가 후 정상 배포 완료

```

tasks:
- name: delete the previous deployment
  win_command: kubectl delete deployment.apps/cicd-deployment
  ignore_errors: yes

```

- k8s에서 생성 결과 확인

```
> kubectl get all
```

NAME	READY	STATUS	RESTARTS	AGE
pod/cicd-deployment-68f8594f94-cnsj6	1/1	Running	0	34s
pod/cicd-deployment-68f8594f94-f5fpt	1/1	Running	0	34s

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
service/cicd-service	NodePort	10.108.31.247	<none>	8080:32000/TCP	26s
service/kubernetes	ClusterIP	10.96.0.1	<none>	443/TCP	4d

NAME	READY	UP-TO-DATE	AVAILABLE	AGE
------	-------	------------	-----------	-----

deployment.apps/cicd-deployment	2/2	2	2	34s
NAME		DESIRED	CURRENT	READY
AGE				
replicaset.apps/cicd-deployment-68f8594f94	2	2	2	34s



7. CI/CD Process

- CI jobs
 - git pull
 - create a docker image
 - push the image to the registry
 - remove the image from the local
- CD jobs
 - create a deployment (replicaset:2)
 - create a service

ansible 서버에서 작업

- create-cicd-devops-image.yml 파일 생성

```
- hosts: all
#   become: true

tasks:
- name: create a docker image with deployed waf file
  command: docker build -t aheeej/cicd-project-ansible .
  args:
    chdir: /root
```

- name: push the image on Docker Hub
command: docker push aheeej/cicd-project-ansible
- name: remove the docker image from the ansible server
command: docker rmi aheeej/cicd-project-ansible

- Dockerfile 생성

```
FROM tomcat:9.0

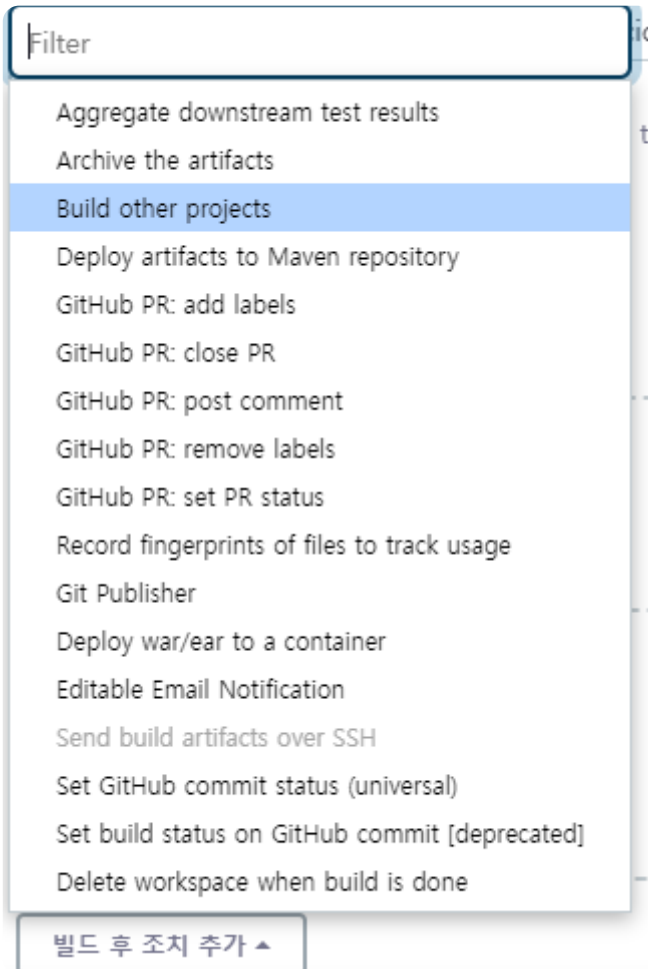
LABEL org.opencontainers.image.authors="edowon0623@gmail.com"

COPY ./hello-world.war /usr/local/tomcat/webapps
```

jenkins에서 작업

- 6번에서 생성한 item copy > My-Ansible-Project-CI
- Exec command 변경
 - ansible-playbook -i ./k8s/hosts create-cicd-devops-image.yml --limit ansible-server

- 빌드 후 조치에서 Build other projects 추가한 뒤 6번에서 생성한 프로젝트 선택



- CI 빌드 결과

```
Waiting for Jenkins to finish collecting data
[JENKINS] Archiving /var/jenkins_home/workspace/My-Ansible-Project-CI/pom.xml to
com.njonecompany.web/web/1.0/web-1.0.pom
[JENKINS] Archiving /var/jenkins_home/workspace/My-Ansible-Project-CI/target/hello-world.war to
com.njonecompany.web/web/1.0/web-1.0.war
channel stopped
SSH: Connecting from host [eb0201ac5fe0]
SSH: Connecting with configuration [ansible-host] ...
SSH: EXEC: completed after 19,223 ms
SSH: Disconnecting configuration [ansible-host] ...
SSH: Transferred 1 file(s)
Triggering a new build of My-Ansible-Project
Finished: SUCCESS
```

- CD 빌드 결과

```
> kubectl get all
```

NAME	READY	STATUS	RESTARTS	AGE
pod/cicd-deployment-68f8594f94-nx8br	1/1	Running	0	35s
pod/cicd-deployment-68f8594f94-v946h	1/1	Running	0	35s

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)
AGE				
service/cicd-service	NodePort	10.104.70.104	<none>	
8080:32000/TCP				28s
service/kubernetes	ClusterIP	10.96.0.1	<none>	443/TCP
5d				

NAME	READY	UP-TO-DATE	AVAILABLE	AGE
deployment.apps/cicd-deployment	2/2	2	2	35s

NAME	DESIRED	CURRENT	READY
AGE			
replicaset.apps/cicd-deployment-68f8594f94	2	2	2
35s			