

## Screenshots Agenda

All steps are described in project readme file.

All source codes are included in project.

Project Github: <https://github.com/serjikisagholian/capstone-k8s>

1. AWS EC2 dashboard before beginning
2. Provisioning AWS using Ansible
3. Provisioning Kubernetes cluster on AWS
4. Provisioning Vagrant instances, Kubernetes, FlaskApp deployment and custom service account
5. Take snapshot from ETCD
6. Check Custom Service Account permissions
7. Testing HorizontalPodAutoscaler and number of pods with CPU usage increase

## Start with a clean dashboard

The screenshot shows the AWS EC2 Dashboard. On the left, there's a sidebar with navigation links like 'Instances', 'Images', and 'AMIs'. The main area has a heading 'Welcome to the new EC2 console!' with a note about redesigning the console. Below it is a 'Resources' section showing metrics for Instances (running), Dedicated Hosts, Elastic IPs, Instances, Key pairs, Load balancers, Placement groups, Security groups, Snapshots, and Volumes, all of which are currently at 0. To the right is an 'Account attributes' panel showing supported platforms (VPC), default VPC (vpc-08591133c6b405e22), settings for EBS encryption, zones, EC2 Serial Console, Default credit specification, and Console experiments. At the bottom right is an 'Explore AWS' button.

## Provision AWS with ansible

```
>> export AWS_ACCESS_KEY_ID=<AWS_ACCESS_KEY>
>> export AWS_SECRET_ACCESS_KEY=<AWS_SECRET_KEY>
>> export AWS_SECURITY_TOKEN=<AWS_SECURITY_TOKEN>
>> export AWS_REGION=<AWS_REGION>
>> cd aws-version
>> ansible-playbook provision.yml
```

The terminal window shows the execution of an Ansible playbook named 'provision.yml'. The output includes several warning messages, such as 'WARNING: No inventory was parsed, only implicit localhost is available' and 'WARNING: provided hosts list is empty, only localhost is available. Note that the implicit localhost does not match 'all''. The playbooks are being run on a local host. The terminal also displays configuration details for various AWS services like EC2, ELB, and IAM.

## AWS with ansible (output)

```
(ans01) c-serjik.isagholian@MACC02Z20DLV0D aws-version % ansible-playbook provision.yml
```

Provision

```
[WARNING]: No inventory was parsed, only implicit localhost is available
[WARNING]: provided hosts list is empty, only localhost is available. Note that the implicit localhost does not match 'all'
PLAY [localhost] ****
TASK [Gathering Facts] ****
ok: [localhost]
TASK [create a new ec2 key pair, returns generated private key] ****
changed: [localhost]
TASK [Save private key on local] ****
changed: [localhost]
TASK [Create EC2 group] ****
[WARNING]: One of your CIDR addresses (10.0.0/0) has host bits set. To get rid of this warning, check the network mask and make sure that only network bits are set: 0.0.0/0.
changed: [localhost]
TASK [Create ELB] ****
changed: [localhost]
TASK [provision master] ****
changed: [localhost]
TASK [associate new elastic IPs with master] ****
changed: [localhost] => (item=i-0002e017129573ec0)
TASK [output the k8s master] ****
ok: [localhost] => {
  "msg": {
    "changed": true,
    "failed": false,
    "instance_ids": [
      "i-0002e017129573ec0"
    ],
    "instances": [
      {
        "ami_launch_index": "0",
        "architecture": "x86_64",
        "block_device_mapping": {
          "dev/sda1": {
            "delete_on_termination": true,
            "status": "attached",
            "volume_id": "vol-0b34b568930c3255"
          }
        },
        "dns_name": "ec2-54-210-134-184.compute-1.amazonaws.com",
        "ebs_optimized": false,
        "groups": [
          "sg-0ac101e3ee1f7ba33": "ec2group01",
          "sg-0e22d51bed7cd6f1": "default_elb_g032fbef7-68b3-3f05-b5bf-59b60f9c9f76"
        ],
        "hypervisor": "xen",
        "id": "i-0002e017129573ec0",
        "image_id": "ami-0747bdcab034c712a",
        "instance_type": "t2.micro",
        "kernel": null,
        "key_name": "my_keypair",
        "launch_time": "2021-08-14T19:09:15.000Z",
        "placement_group_id": null,
        "private_dns_name": "ip-172-31-23-208.ec2.internal",
        "private_ip": "172.31.23.208",
        "public_dns_name": "ec2-54-210-134-184.compute-1.amazonaws.com",
        "public_ip": "54.210.134.184",
        "ramdisk": null,
        "region": "us-east-1",
        "root_device_name": "/dev/sda1",
        "root_device_type": "ebs",
        "state": "running",
        "state_code": 16,
        "tags": {},
        "tenancy": "default",
        "virtualization_type": "hvm"
      }
    ],
    "tagged_instances": []
  }
}
TASK [output master_ip] ****
ok: [localhost] => {
  "msg": {
    "changed": true,
    "msg": "All items completed",
    "results": [
      {
        "allocation_id": "eipalloc-04f7c0f5006f784c3",
        "ansible_loop_var": "item",
        "changed": true,
        "failed": false,
        "invocation": {
          "module_args": {
            "allow_reassociation": false,
            "aws_access_key": null,
            "aws_ca_bundle": null,
            "aws_config": null,
            "aws_secret_key": null,
            "debug_botocore_endpoint_logs": false,
            "device_id": "i-0002e017129573ec0",
            "ec2_url": null,
            "in_vpc": true,
            "private_ip_address": null,
            "public_ip": null,
            "public_ipv4_pool": null,
            "region": null,
            "release_on_dissociation": false,
            "reuse_existing_ip_allowed": false,
            "security_token": null,
            "state": "present",
            "tag_name": null,
            "tag_value": null,
            "validate_certs": true,
            "wait_timeout": null
          }
        },
        "item": "i-0002e017129573ec0",
        "public_ip": "3.210.215.168"
      }
    ]
  }
}
TASK [Create a fresh inventory] ****
changed: [localhost]
TASK [Add master to local host group] ****
changed: [localhost] => (item='changed': True, 'public_ip': '3.210.215.168', 'allocation_id': 'eipalloc-04f7c0f5006f784c3', 'invocation': {'module_args': {'device_id': 'i-0002e017129573ec0', 'in_vpc': True, 'debug_botocore_endpoint_logs': False, 'validate_certs': True, 'state': 'present', 'reuse_existing_ip_allowed': False, 'release_on_dissociation': False, 'allow_reassociation': True}, 'ansible_loop_var': 'item'})
TASK [Wait for servers to come online] ****
ok: [localhost] => (item={'changed': True, 'public_ip': '3.210.215.168', 'allocation_id': 'eipalloc-04f7c0f5006f784c3', 'invocation': {'module_args': {'device_id': 'i-0002e017129573ec0', 'in_vpc': True, 'debug_botocore_endpoint_logs': False, 'validate_certs': True, 'state': 'present', 'reuse_existing_ip_allowed': False, 'release_on_dissociation': False, 'allow_reassociation': True}, 'profile': None, 'aws_config': None, 'region': None, 'public_ip': None, 'wait_timeout': None, 'private_ip_address': None, 'tag_name': None, 'tag_value': None, 'public_ipv4_pool': None}}, 'failed': False, 'item': 'i-0002e017129573ec0', 'ansible_loop_var': 'item')}
```

```

TASK [Add master as known hosts] *****
changed: [localhost] *****
changed: [localhost] => (item={'changed': True, 'public_ip': '3.210.215.168', 'allocation_id': 'eipalloc-04f7c0f5006f784c3', 'invocation': {'module_args': {'device_id': 'i-0002e017129573ec0', 'in_vpc': True, 'debug_botocore_endpoint_logs': False, 'validate_certs': True, 'state': 'present', 'reuse_existing_ip_allowed': False, 'release_on_disassociation': False, 'allow_reassociation': False, 'ec2_url': None, 'aws_access_key': None, 'aws_secret_key': None, 'security_token': None, 'aws_ca_bundle': None, 'profile': None, 'aws_config': None, 'region': None, 'public_ip': None, 'wait_timeout': None, 'private_ip_address': None, 'tag_name': None, 'tag_value': None, 'public_ipv4_pool': None}}, 'failed': False, 'item': 'i-0002e017129573ec0', 'ansible_loop_var': 'item'})

TASK [provision nodes] *****
changed: [localhost]
changed: [localhost] => (item={-05761120bc07e5dfa}
changed: [localhost] => (item={-0bb183fa6d4e0bd3}

TASK [Add nodes section to inventory] *****
changed: [localhost]

TASK [Add nodes to local host group] *****
changed: [localhost] => (item={'changed': True, 'public_ip': '52.21.155.93', 'allocation_id': 'eipalloc-0067f0820a5f5d2d7', 'invocation': {'module_args': {'device_id': 'i-05761120bc07e5dfa', 'in_vpc': True, 'debug_botocore_endpoint_logs': False, 'validate_certs': True, 'state': 'present', 'reuse_existing_ip_allowed': False, 'release_on_disassociation': False, 'allow_reassociation': False, 'ec2_url': None, 'aws_access_key': None, 'aws_secret_key': None, 'security_token': None, 'aws_ca_bundle': None, 'profile': None, 'aws_config': None, 'region': None, 'public_ip': None, 'wait_timeout': None, 'private_ip_address': None, 'tag_name': None, 'tag_value': None, 'public_ipv4_pool': None}}, 'failed': False, 'item': 'i-05761120bc07e5dfa', 'ansible_loop_var': 'item'})

changed: [localhost] => (item={'changed': True, 'public_ip': 'eipalloc-0c29084297192d5f', 'invocation': {'module_args': {'device_id': 'i-0bb183fa6d4e0bd3', 'in_vpc': True, 'debug_botocore_endpoint_logs': False, 'validate_certs': True, 'state': 'present', 'reuse_existing_ip_allowed': False, 'release_on_disassociation': False, 'allow_reassociation': False, 'ec2_url': None, 'aws_access_key': None, 'aws_secret_key': None, 'security_token': None, 'aws_ca_bundle': None, 'profile': None, 'aws_config': None, 'region': None, 'public_ip': None, 'wait_timeout': None, 'private_ip_address': None, 'tag_name': None, 'tag_value': None, 'public_ipv4_pool': None}}, 'failed': False, 'item': 'i-0bb183fa6d4e0bd3', 'ansible_loop_var': 'item'})

TASK [Wait for servers to come online] *****
ok: [localhost] => (item={'changed': True, 'public_ip': '52.21.155.93', 'allocation_id': 'eipalloc-0067f0820a5f5d2d7', 'invocation': {'module_args': {'device_id': 'i-05761120bc07e5dfa', 'in_vpc': True, 'debug_botocore_endpoint_logs': False, 'validate_certs': True, 'state': 'present', 'reuse_existing_ip_allowed': False, 'release_on_disassociation': False, 'allow_reassociation': False, 'ec2_url': None, 'aws_access_key': None, 'aws_secret_key': None, 'security_token': None, 'aws_ca_bundle': None, 'profile': None, 'aws_config': None, 'region': None, 'public_ip': None, 'wait_timeout': None, 'private_ip_address': None, 'tag_name': None, 'tag_value': None, 'public_ipv4_pool': None}}, 'failed': False, 'item': 'i-05761120bc07e5dfa', 'ansible_loop_var': 'item'})
ok: [localhost] => (item={'changed': True, 'public_ip': '3.232.24.170', 'allocation_id': 'eipalloc-0c29084297192d5f', 'invocation': {'module_args': {'device_id': 'i-0bb183fa6d4e0bd3', 'in_vpc': True, 'debug_botocore_endpoint_logs': False, 'validate_certs': True, 'state': 'present', 'reuse_existing_ip_allowed': False, 'release_on_disassociation': False, 'allow_reassociation': False, 'ec2_url': None, 'aws_access_key': None, 'aws_secret_key': None, 'security_token': None, 'aws_ca_bundle': None, 'profile': None, 'aws_config': None, 'region': None, 'public_ip': None, 'wait_timeout': None, 'private_ip_address': None, 'tag_name': None, 'tag_value': None, 'public_ipv4_pool': None}}, 'failed': False, 'item': 'i-0bb183fa6d4e0bd3', 'ansible_loop_var': 'item'})

TASK [Add nodes as known hosts] *****
changed: [localhost] => (item={'changed': True, 'public_ip': '52.21.155.93', 'allocation_id': 'eipalloc-0067f0820a5f5d2d7', 'invocation': {'module_args': {'device_id': 'i-05761120bc07e5dfa', 'in_vpc': True, 'debug_botocore_endpoint_logs': False, 'validate_certs': True, 'state': 'present', 'reuse_existing_ip_allowed': False, 'release_on_disassociation': False, 'allow_reassociation': False, 'ec2_url': None, 'aws_access_key': None, 'aws_secret_key': None, 'security_token': None, 'aws_ca_bundle': None, 'profile': None, 'aws_config': None, 'region': None, 'public_ip': None, 'wait_timeout': None, 'private_ip_address': None, 'tag_name': None, 'tag_value': None, 'public_ipv4_pool': None}}, 'failed': False, 'item': 'i-05761120bc07e5dfa', 'ansible_loop_var': 'item'})

changed: [localhost] => (item={'changed': True, 'public_ip': '3.232.24.170', 'allocation_id': 'eipalloc-0c29084297192d5f', 'invocation': {'module_args': {'device_id': 'i-0bb183fa6d4e0bd3', 'in_vpc': True, 'debug_botocore_endpoint_logs': False, 'validate_certs': True, 'state': 'present', 'reuse_existing_ip_allowed': False, 'release_on_disassociation': False, 'allow_reassociation': False, 'ec2_url': None, 'aws_access_key': None, 'aws_secret_key': None, 'security_token': None, 'aws_ca_bundle': None, 'profile': None, 'aws_config': None, 'region': None, 'public_ip': None, 'wait_timeout': None, 'private_ip_address': None, 'tag_name': None, 'tag_value': None, 'public_ipv4_pool': None}}, 'failed': False, 'item': 'i-0bb183fa6d4e0bd3', 'ansible_loop_var': 'item'})

PLAY RECAP *****
localhost : ok=19 changed=14 unreachable=0 failed=0 skipped=0 rescued=0 ignored=0
(ans01) c-serjik.isagholian@MACC02Z20DDLVQ aws-version %

```

## Dashboard after provisioning

Welcome to the new EC2 console. We're redesigning the EC2 console to make it easier to use and improve performance. We'll release new versions periodically. We encourage you to try them and let us know where we can make improvements. To switch between the old console and the new console, use the New EC2 Experience toggle above the navigation panel.

**Resources**

You are using the following Amazon EC2 resources in the US East (N. Virginia) Region:

Instances (running)	Dedicated Hosts	Elastic IPs
5	0	3
Instances	Key pairs	Load balancers
Placement groups	Security groups	Snapshots
Volumes		

**Account attributes**

Supported platforms: VPC  
Default VPC: vpc-08591133c6b405e22  
Settings: EBS encryption, Zones, EC2 Serial Console, Default credit specification, Console experiments

**Explore AWS**

## Instances

Welcome to the new Instances experience. We're redesigning the EC2 console to make it easier to use. To switch between the old console and the new console, use the New EC2 Experience toggle above the navigation panel. We'll release updates continuously based on customer feedback.

**Instances (3) Info**

Filter instances: Instance state: running

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS	Public IP
-	i-0002e017129573ec0	Running	t2.micro	2/2 checks passed	No alarms +	us-east-1d	ec2-5-210-215-168.com...	\$210.215
-	i-05761120bc07e5dfa	Running	t2.micro	2/2 checks passed	No alarms +	us-east-1d	ec2-52-21-155-93.com...	\$22.115
-	i-0bb183fa6d4e0bd3	Running	t2.micro	2/2 checks passed	No alarms +	us-east-1d	ec2-5-232-24-170.com...	\$232.24

## Master node

The screenshot shows the AWS EC2 Instance Details page for instance i-0002e017129573ec0. The instance is running an t2.micro instance type with a public IPv4 address of 3.210.215.168 and a private IPv4 address of 172.31.23.208. It is associated with a VPC ID vpc-0e591133c4b405e22 and a subnet ID subnet-06b71930bf7028b8a. The IAM role is listed as empty. A note indicates an AWS Compute Optimizer binding error: "User: arn:aws:sts::53085765363:assumed-role/ComputeOptimizerRole/raghulan\_gmail is not authorized to perform: compute-optimizer:SetEnrollmentStatus on resource: with an explicit deny".

## EC2 Group Assigned

This screenshot is identical to the one above, showing the EC2 Instance Details page for instance i-0002e017129573ec0. The instance is running an t2.micro instance type with a public IPv4 address of 3.210.215.168 and a private IPv4 address of 172.31.23.208. It is associated with a VPC ID vpc-0e591133c4b405e22 and a subnet ID subnet-06b71930bf7028b8a. The IAM role is empty, and there is a note about the AWS Compute Optimizer binding error.

## Ansible hosts file after provisioning

```
[k8s_master]
3.210.215.168 ansible_user=ubuntu ansible_ssh_private_key_file=~/aws/my_keypair.pem

[k8s_nodes]
52.21.155.93 ansible_user=ubuntu ansible_ssh_private_key_file=~/aws/my_keypair.pem
3.232.24.170 ansible_user=ubuntu ansible_ssh_private_key_file=~/aws/my_keypair.pem
```

## Testing connectivity

```
>> ansible -m ping k8s_master -i ansible_hosts
>> ansible -m ping k8s_nodes -i ansible_hosts
```

```
(ans01) c-serjik.tsagholian@MACC0ZZ0DDLVQ aws-version % cat ansible_hosts
[k8s_master] ansible_user=ubuntu ansible_ssh_private_key_file=~/aws/my_keypair.pem
3.210.215.168 ansible_user=ubuntu ansible_ssh_private_key_file=~/aws/my_keypair.pem
3.232.24.170 ansible_user=ubuntu ansible_ssh_private_key_file=~/aws/my_keypair.pem
(ans01) c-serjik.tsagholian@MACC0ZZ0DDLVQ aws-version % ansible k8s_master -m ping -i ansible_hosts
3.210.215.168 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3"
    },
    "changed": false,
    "ping": "pong"
} [node-playbook.yml]
3.232.24.170 | node-playbook.yml
(ans01) c-serjik.tsagholian@MACC0ZZ0DDLVQ aws-version % ansible k8s_nodes -m ping -i ansible_hosts
3.232.24.170 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3"
    },
    "changed": false,
    "ping": "pong"
} [node-playbook.yml]
3.21.155.93 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3"
    },
    "changed": false,
    "ping": "pong"
} [README.md]
52.21.155.93 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3"
    },
    "changed": false,
    "ping": "pong"
} [one01.docx]
(ans01) c-serjik.tsagholian@MACC0ZZ0DDLVQ aws-version %
```

Provisioning Kubernetes (need at least t3.small for master – 2 cores, 1700 Mib)

```
>> ansible-playbook master-playbook.yml -i ansible_hosts  
>> ansible-playbook node-playbook.yml -i ansible_hosts
```

The following error shows lack of enough resources (we need at least t3.small for master)

```
TASK [Configure node_ip] *****
changed: [3.210.215.168]

TASK [Restart kubelet] *****
changed: [3.210.215.168]

TASK [Initialize the Kubernetes cluster using kubeadm] *****
fatal: [3.210.215.168]: FAILED! => {"changed": true, "cmd": ["kubeadm", "init", "--apiserver-advertise-address=3.210.215.168", "--apiserver-cert-extra-sans=3.210.215.168", "--node-name", "k8s-master", "--pod-network-cidr=192.168.0.0/16"], "delta": "0:00:02.761902", "end": "2021-05-14 19:42:55.599058", "msg": "non-zero return code", "rc": 1, "start": "2021-05-14 19:42:52.837156", "stderr": "\t[WARNING IsDockerSystemdCheck] detected '\\"cgroupsfs\\"' as the Docker cgroup driver. The recommended driver is '\\"systemd\\"'. Please follow the guide at https://kubernetes.io/docs/setup/cri/\n\t[WARNING Hostname] hostname '\\"k8s-master\\"' could not be reached\n\t[ERROR NumCPU] the number of available CPUs 1 is less than the required 2\n\t[ERROR Mem] the system RAM (978 MB) is less than the minimum 1700 MB\n[preflight] If you know what you are doing, you can make a check non-fatal with --ignore-preflight-errors='\"v1.21.1\"'\n[preflight] Some fatal errors occurred: \"\t[WARNING Hostname] hostname '\\"k8s-master\\"' could not be reached\", \"\t[WARNING NumCPU] the number of available CPUs 1 is less than the required 2\", \"\t[ERROR Mem] the system RAM (978 MB) is less than the minimum 1700 MB\"\n[preflight] If you know what you are doing, you can make a check non-fatal with --ignore-preflight-errors='\"v1.21.1\"'\n[preflight] Some fatal errors occurred: \"\t[WARNING Hostname] hostname '\\"k8s-master\\"' could not be reached\", \"\t[WARNING NumCPU] the number of available CPUs 1 is less than the required 2\", \"\t[ERROR Mem] the system RAM (978 MB) is less than the minimum 1700 MB\"\n[init] Using Kubernetes version: v1.21.1\n[preflight] Running pre-flight checks", "stdout_lines": "[\"[init] Using Kubernetes version: v1.21.1\", \"[preflight] Running pre-flight checks\"]"]

RUNNING HANDLER [docker status] *****

PLAY RECAP *****
3.210.215.168 : ok=12 changed=10 unreachable=0 failed=1 skipped=1 rescued=0 ignored=0
```

Screenshot

## Ansible output

```
(ans01) c-serjik.isagholian@MACC02Z20DLVQ aws-version % ansible-playbook master-playbook.yml -i ansible_hosts
PLAY [k8s_master]
*****
TASK [Gathering Facts]
*****
ok: [3.210.215.168]

TASK [Install packages that allow apt to be used over HTTPS]
*****
changed: [3.210.215.168]

TASK [Add an apt signing key for Docker]
*****
changed: [3.210.215.168]

TASK [Add apt repository for stable version]
*****
changed: [3.210.215.168]

TASK [Install docker and its dependecies]
*****
changed: [3.210.215.168]

TASK [Add "ubuntu" user to docker group]
*****
changed: [3.210.215.168]

TASK [Remove swapfile from /etc/fstab]
*****
ok: [3.210.215.168] => (item=swap)
ok: [3.210.215.168] => (item=none)

TASK [Disable swap]
*****
skipping: [3.210.215.168]

TASK [Add an apt signing key for Kubernetes]
*****
changed: [3.210.215.168]

TASK [Adding apt repository for Kubernetes]
*****
changed: [3.210.215.168]

TASK [Install Kubernetes binaries]
*****
changed: [3.210.215.168]

TASK [Configure node_ip]
*****
changed: [3.210.215.168]

TASK [Restart kubelet]
*****
changed: [3.210.215.168]

TASK [Initialize the Kubernetes clucter using kubeadm]
*****
fatal: [3.210.215.168]: FAILED! => {"changed": true, "cmd": ["kubeadm", "init", "--apiserver-advertise-address=3.210.215.168", "--apiserver-cert-extra-sans=3.210.215.168", "--node-name", "k8s-master", "--pod-network-cidr=192.168.0.0/16"], "delta": "0:00:02.761902", "end": "2021-05-14 19:42:55.599058", "msg": "non-zero return code", "rc": 1, "start": "2021-05-14 19:42:52.837156", "stderr": "\t[WARNING IsDockerSystemdCheck] detected '\\"cgroupsfs\\"' as the Docker cgroup driver. The recommended driver is '\\"systemd\\"'. Please follow the guide at https://kubernetes.io/docs/setup/cri/\n\t[WARNING Hostname] hostname '\\"k8s-master\\"' could not be reached\n\t[ERROR NumCPU] the number of available CPUs 1 is less than the required 2\n\t[ERROR Mem] the system RAM (978 MB) is less than the minimum 1700 MB\n[preflight] If you know what you are doing, you can make a check non-fatal with --ignore-preflight-errors='\"v1.21.1\"'\n[preflight] Some fatal errors occurred: \"\t[WARNING Hostname] hostname '\\"k8s-master\\"' could not be reached\", \"\t[ERROR NumCPU] the number of available CPUs 1 is less than the required 2\", \"\t[ERROR Mem] the system RAM (978 MB) is less than the minimum 1700 MB\"\n[preflight] If you know what you are doing, you can make a check non-fatal with --ignore-preflight-errors='\"v1.21.1\"'\n[preflight] Some fatal errors occurred: \"\t[WARNING Hostname] hostname '\\"k8s-master\\"' could not be reached\", \"\t[ERROR NumCPU] the number of available CPUs 1 is less than the required 2\", \"\t[ERROR Mem] the system RAM (978 MB) is less than the minimum 1700 MB\"\n[init] Using Kubernetes version: v1.21.1\n[preflight] Running pre-flight checks", "stdout_lines": "[\"[init] Using Kubernetes version: v1.21.1\", \"[preflight] Running pre-flight checks\"]"]

RUNNING HANDLER [docker status] *****

PLAY RECAP *****
3.210.215.168 : ok=12 changed=10 unreachable=0 failed=1 skipped=1 rescued=0 ignored=0

(ans01) c-serjik.isagholian@MACC02Z20DLVQ aws-version %
```

For rest of the demo we will switch to Vagrant version, because with AWS free version we could not have resources to fulfill.

## Vagrant file

```
IMAGE_NAME = "bento/ubuntu-18.04"
N = 2

Vagrant.configure("2") do |config|
  config.ssh.insert_key = false

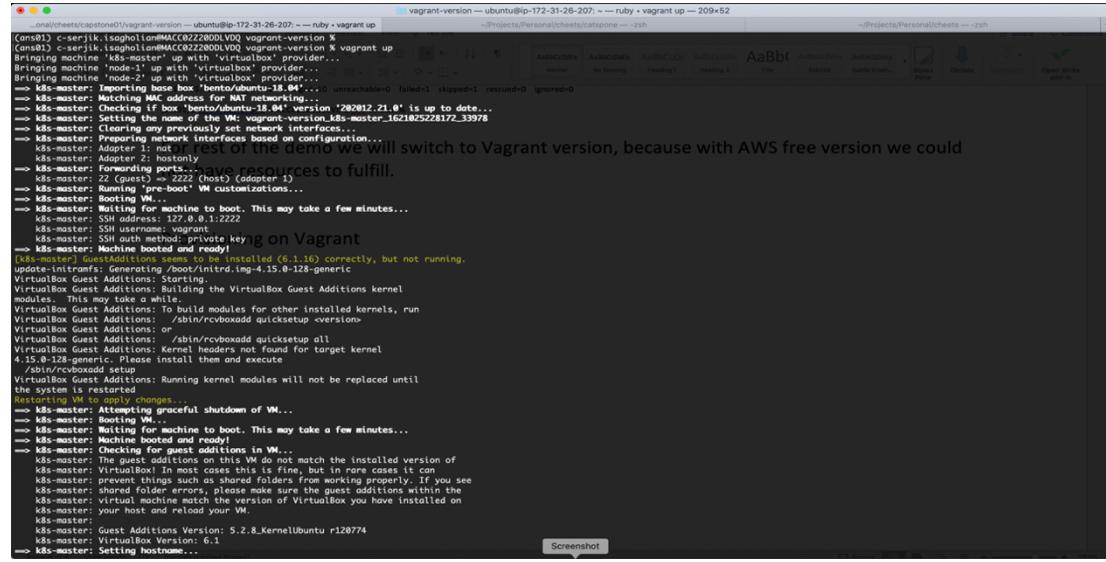
  config.vm.provider "virtualbox" do |v|
    v.memory = 6144
    v.cpus = 4
  end

  config.vm.define "k8s-master" do |master|
    master.vm.box = IMAGE_NAME
    master.vm.network "private_network", ip: "192.168.50.10"
    master.vm.hostname = "k8s-master"
    master.vm.provision "ansible" do |ansible|
      ansible.playbook = "kubernetes-setup/master-playbook.yml"
      ansible.extra_vars = {
        node_ip: "192.168.50.10",
      }
    end
  end

  (1..N).each do |i|
    config.vm.define "node-#{i}" do |node|
      node.vm.box = IMAGE_NAME
      node.vm.network "private_network", ip: "192.168.50.#{i + 10}"
      node.vm.hostname = "node-#{i}"
      node.vm.provision "ansible" do |ansible|
        ansible.playbook = "kubernetes-setup/node-playbook.yml"
        ansible.extra_vars = {
          node_ip: "192.168.50.#{i + 10}",
        }
      end
    end
  end
end
```

## Provisioning on Vagrant

```
>> cd vagrant-version
>> vagrant up
```



```
vagrant-version -- ubuntu@ip-172-31-26-207: ~ -- ruby -v vagrant up -- 209*62
[Consoles] c-serlik-isopathlonMACC22800LVD0 vagrant-version X
[Consoles] c-serlik-isopathlonMACC22800LVD0 vagrant-version X vagrant up
Bringing machine 'k8s-master' up with 'virtualbox' provider...
Bringing machine 'node-1' up with 'virtualbox' provider...
Bringing machine 'node-2' up with 'virtualbox' provider...
└─ k8s-master: Importing base box 'bento/ubuntu-18.04'...
   └─ k8s-master: Unpacking tarball...
   └─ k8s-master: Importing base box 'bento/ubuntu-18.04'...
      └─ k8s-master: Unpacker: failed=1 skipped=1 resused=0 ignored=0
└─ k8s-master: Matching MAC address for NAT networking...
└─ k8s-master: Checking box for 'bento/ubuntu-18.04'...
└─ k8s-master: Setting the name of the VM: vagrant-version-k8s-master_162105222172_33978
└─ k8s-master: Clearing any previously set network interfaces...
└─ k8s-master: Preparing network interfaces based on configuration...
   └─ k8s-master: Adapter 1: hostonly
   └─ k8s-master: Adapter 2: hostonly
└─ k8s-master: Forwarding ports...
   └─ k8s-master: (guest) 2222 (host) Adapter 2
└─ k8s-master: Running 'pre-boot' VM customizations...
└─ k8s-master: Booting VM...
└─ k8s-master: Waiting for machine to boot. This may take a few minutes...
   └─ k8s-master: SSH port: 2222
   └─ k8s-master: SSH username: vagrant
   └─ k8s-master: SSH auth method: private key
   └─ k8s-master: GuestAdditions seem to be installed (6.1.16) correctly, but not running.
update-intrrmfs: Generating '/boot/initrd.img-4.15.0-128-generic'
VirtualBox Guest Additions: Starting.
VirtualBox Guest Additions: Building the VirtualBox Guest Additions kernel modules. This may take a while.
VirtualBox Guest Additions: To build modules for other installed kernels, run 'VirtualBox Guest Additions: or
VirtualBox Guest Additions: on
VirtualBox Guest Additions: /sbin/rcvboxadd quicksetup <version>
VirtualBox Guest Additions: /sbin/rcvboxadd quicksetup all
VirtualBox Guest Additions: Kernel headers not found for target kernel '4.15.0-128-generic'. Please install them and execute
'/sbin/rcvboxadd setup'.
VirtualBox Guest Additions: Running kernel modules will not be replaced until
the system is restarted.
Restoring VM to previous changes...
└─ k8s-master: Attempting graceful shutdown of VM...
└─ k8s-master: Booting VM...
└─ k8s-master: Waiting for machine to boot. This may take a few minutes...
└─ k8s-master: Machine booted and ready!
└─ k8s-master: Checking for guest additions in VM...
   └─ k8s-master: Guest additions seem to be installed but not match the installed version of
   └─ k8s-master: VirtualBox. In most cases this is fine, but in rare cases it can
   └─ k8s-master: prevent things such as shared folders from working properly. If you see
   └─ k8s-master: shared folder errors, please make sure the guest additions within the
   └─ k8s-master: VM are at the same version as the guest additions version of VirtualBox you have installed on
   └─ k8s-master: your host and reload your VM.
k8s-master:
└─ k8s-master: Guest Additions Version: 5.2.8_KernelUbuntu r120774
k8s-master: VirtualBox Version: 6.1
└─ k8s-master: Setting hostname...
```

```

vagrant-version -- ubuntu@ip-172-31-26-207: ~ -- Python + vagrant up -- 209x52
...heets/capstone01/vagrant-version -- ubuntu@ip-172-31-26-207: ~ -- Python + vagrant up ~ /Projects/Personal/cheats/capstone --- zsh
-- k8s-master: Guest Additions Version: 5.2.8.KernelUbuntu r12074
-- k8s-master: VirtualBox Version: 6.1
--> k8s-master: Setting up host environment
--> k8s-master: Configuring and enabling network interfaces...
--> k8s-master: Mounting shared folders...
--> k8s-master: /vagrant => /Users/c-serjik.isogholian/Projects/Personal/cheats/capstone01/vagrant-version
--> k8s-master: Running provisioner: ansible...
--> k8s-master: Running ansible-playbook, waiting on Vagrant
PLAY [all] *****
  TASK [Gathering Facts] *****
[DEPRECATION WARNING]: Distribution Ubuntu 18.04 on host k8s-master should use /usr/bin/python3, but it is using /usr/bin/python for backward compatibility with python dependencies. A warning will be displayed every time you run Ansible. You can discover platform python for this host. See https://docs.ansible.com/ansible/2.10/reference_appendices/interpreter_discovery.html for more information. This feature will be removed in version 2.12. Deprecation warnings can be disabled by setting depreciation_warnings=False in ansible.cfg. interfaces based on configuration...
OK: [k8s-master]
  TASK [Install packages that allow apt to be used over HTTPS] *****
[WARNING]: Updating cache and auto-installing missing dependency: python-opt
changed: [k8s-master]
  >>> k8s-master: Waiting for machine to boot. This may take a few minutes...
  TASK [Add an opt signing key for Docker] *****
changed: [k8s-master]
  TASK [Add apt repository for stable version] *****
changed: [k8s-master]
  TASK [Install docker and its dependecies] *****
changed: [k8s-master]
  >>> k8s-master: VirtualBox Guest Additions: Building the VirtualBox guest Additions kernel module...
  TASK [Add vagrant user to docker group] *****
changed: [k8s-master]
  >>> k8s-master: VirtualBox Guest Additions: Running kernel modules will not be replaced until
  TASK [Remove swapfile from /etc/fstab] *****
ok: [k8s-master] => (item=None) Attaching general shutdown of VM
changed: [k8s-master]
  >>> k8s-master: Waiting for machine to boot. This may take a few minutes...
  TASK [Disable swap] *****
changed: [k8s-master]
  >>> k8s-master: VirtualBox Guest Additions: In most cases this file is in /etc/fstab. In rare cases it is in /etc/defaults/fstab. If you see
  >>> k8s-master: swapfile listed in /etc/fstab, you need to remove it and reboot your VM
  TASK [Add an opt signing key for Kubernetes] *****
changed: [k8s-master]
  >>> k8s-master: VirtualBox Guest Additions: GPG key for Kubernetes repository installed on
  TASK [Adding apt repository for Kubernetes] *****
changed: [k8s-master]
  TASK [Install Kubernetes binaries] *****
changed: [k8s-master]
  Screenshot
vagrant-version -- ubuntu@ip-172-31-26-207: ~ -- ssh + vagrant up -- 209x52
...onal/cheats/capstone01/vagrant-version -- ubuntu@ip-172-31-26-207: ~ -- ssh + vagrant up ~ /Projects/Personal/cheats/capstone --- zsh
-- k8s-master: Guest Additions Version: 5.2.8.KernelUbuntu r12074
-- k8s-master: VirtualBox Version: 6.1
--> k8s-master: Setting up host environment
--> k8s-master: Configuring and enabling network interfaces...
--> k8s-master: Mounting shared folders...
--> k8s-master: /vagrant => /Users/c-serjik.isogholian/Projects/Personal/cheats/capstone01/vagrant-version
--> k8s-master: Running provisioner: ansible...
--> k8s-master: Running ansible-playbook, waiting on Vagrant
PLAY [all] *****
  TASK [Install Kubernetes binaries] *****
changed: [k8s-master]
  TASK [Configure node ip] *****
changed: [k8s-master]
  TASK [Restart kubelet] *****
changed: [k8s-master]
  TASK [Initialize the Kubernetes cluster using kubeadm] *****
changed: [k8s-master]
  TASK [Setup kubeconfig for vagrant user] *****
changed: [k8s-master] => (item=mkdir -p /home/vagrant/.kube)
changed: [k8s-master] => (item=sudo cp -l /etc/kubernetes/admin.conf /home/vagrant/.kube/config)
changed: [k8s-master] => (item=chown vagrant:vagrant /home/vagrant/.kube/config)
[WARNING]: Consider using the file module with state=directory rather than running 'mkdir'. If you need to use command because file is insufficient you can add 'warn: false' to this command task or set 'command_warnings=False' in ansible.cfg to get rid of this message.
[WARNING]: Consider using 'become', 'become_method', and 'become_user' rather than command module's sudo parameter.
[WARNING]: Consider using the file module with owner rather than running 'chown'. If you need to use command because file is insufficient you can add 'warn: false' to this command task or set 'command_warnings=False' in ansible.cfg to get rid of this message.
  TASK [Install weave network] *****
changed: [k8s-master]
  TASK [Generate join command] *****
changed: [k8s-master]
  TASK [Printing join command] *****
ok: [k8s-master] => {
  "msg": "kubeadm join 192.168.50.10:6443 --token n6rcwu.d9j3limwsahe04ja --discovery-token-ca-cert-hash sha256:e05b375ebf2285daaf5lob2cae7f9241894fb473e3060519f08dc23e07b3b2e9"
}
  TASK [Copy join command to local file] *****
changed: [k8s-master]
  TASK [Install metrics-server] *****
changed: [k8s-master]
  TASK [Copy deployment files] *****
changed: [k8s-master]
  TASK [Deploy application] *****
changed: [k8s-master]
  TASK [Create Custom Roles and Service Account] *****
changed: [k8s-master]
  Screenshot

```



```

vagrant-version -- ubuntu@ip-172-31-26-207: ~ -- zsh -- 209x52
~/Projects/Personal/cheets/capstone01/vagrant-version -- ubuntu@ip-172-31-26-207: ~ -- zsh
~/Projects/Personal/cheets/capstone -- zsh
Normal No Spacing Heading 1 Heading 2 Title Subtitle Autocorrect Autocapitalize Spellcheck Dictate Sensitive Open Write auto-in
TASK [Adding apt repository for Kubernetes]
changed: [node-1]
TASK [Install Kubernetes binaries]
changed: [node-1]
TASK [Configure node ip]
changed: [node-1]
TASK [Restart kubelet]
changed: [node-1]
TASK [Copy the join command to server location]
changed: [node-1]
TASK [Join the node to cluster]
changed: [node-1]
RUNNING HANDLER [docker status]
ok: [node-1]
PLAY RECAP *****
node-1 : ok=16 changed=14 unreachable=0 failed=0 skipped=0 rescued=0 ignored=0
=> node-2: Importing base box 'bento/ubuntu-18.04' ...
=> node-2: Matching MAC address for NAT networking...
=> node-2: Checking if box 'bento/ubuntu-18.04' version '202012.21.0' is up to date...
=> node-2: Setting the name of the VM: vagrant-version_node-2_1621025632654_75694
=> node-2: Fixed port collision for 22 => 2222. Now on port 2281.
=> node-2: Clearing any previously set network interfaces...
=> node-2: Preparing network interfaces based on configuration...
node-2: Adapter 1: nat
node-2: Adapter 2: hostonly
=> node-2: Forwarding ports...
node-2: (guest) 2281 => 2281 (host) (adapter 2) (bento)
=> node-2: Running 'pre-boot' VM customizations...
=> node-2: Booting VM...
=> node-2: Waiting for machine to boot. This may take a few minutes...
node-2: SSH address: 127.0.0.1:2281
node-2: SSH username: vagrant
node-2: SSH auth method: private key
=> node-2: Machine booted and ready!
(node-2) guestAdditions seems to be installed (6.1.16) correctly, but not running.
Updating guest additions kernel module: Building /boot/initrd.lz-4.15.0-128-generic
VirtualBox Guest Additions: Starting.
VirtualBox Guest Additions: Building the VirtualBox Guest Additions kernel modules. This may take a while.
VirtualBox Guest Additions: To build modules for other installed kernels, run
VirtualBox Guest Additions: /sbin/ncvboxadd quicksetup <version>
VirtualBox Guest Additions: or
VirtualBox Guest Additions: /sbin/ncvboxadd quicksetup all
Screenshot
vagrant-version -- ubuntu@ip-172-31-26-207: ~ -- zsh -- 209x52
~/Projects/Personal/cheets/capstone01/vagrant-version -- ubuntu@ip-172-31-26-207: ~ -- zsh
~/Projects/Personal/cheets/capstone -- zsh
Normal No Spacing Heading 1 Heading 2 Title Subtitle Autocorrect Autocapitalize Spellcheck Dictate Sensitive Open Write auto-in
VirtualBox Guest Additions: /sbin/ncvboxadd quicksetup all
VirtualBox Guest Additions: Kernel headers not found for target kernel 4.15.0-128-generic. Please install them and execute /sbin/ncvboxadd setup
VirtualBox Guest Additions: Running kernel modules will not be replaced until the system is restarted
Restarting VM to apply changes...
=> node-2: Attempting graceful shutdown of VM...
=> node-2: Booting VM...
=> node-2: Waiting for machine to boot. This may take a few minutes...
node-2: Warning: Connection reset. Retrying...
=> node-2: Waiting for machine to boot. This may take a few minutes...
=> node-2: Checking for guest additions in VM...
=> node-2: The guest additions on this VM do not match the installed version of (2020-75694)
=> node-2: VirtualBox! In most cases this is fine, but in rare cases it can
node-2: prevent things such as shared folders from working properly. If you see
node-2: shared folder errors, please make sure the guest additions within the
node-2: virtual machine match the version of VirtualBox you have installed on
node-2: your host and reload your VM.
node-2: 
node-2: Guest Additions Version: 5.2.8_KernelUbuntu r120774
node-2: VirtualBox Version: 6.1.2_Ubuntu 18.04.1 LTS (64-bit)
=> node-2: Setting hostnames...
=> node-2: Configuring and enabling network interfaces...
=> node-2: Mounting shared folders...
node-2: /vagrant => /Users/c-serjik.1sagholian/Projects/Personal/cheets/capstone01/vagrant-version
=> node-2: Running provider: ansible...
node-2: 
VirtualBox Guest Additions: To build modules for other installed kernels, run
PLAY [all] *****
TASK [Gathering Facts]
[DEPRECATION WARNING]: Distribution Ubuntu 18.04 on host node-2 should use /usr/bin/python3, but is using /usr/bin/python for backward compatibility with prior Ansible releases. A future Ansible release will default to using the discovered platform python for this host. See https://docs.ansible.com/ansible/2.10/reference_appendices/interpreter_discovery.html for more information. This feature will be removed in version 2.12. Deprecation warnings can be disabled by setting deprecation_warnings=False in ansible.cfg.
ok: [node-2]
TASK [Install packages that allow opt to be used over HTTPS]
[WARNING]: Updating cache and auto-installing missing dependency: python-opt
changed: [node-2]
TASK [Add an apt signing key for Docker]
changed: [node-2]
TASK [Add apt repository for stable version]
changed: [node-2]
TASK [Install docker and its dependencies]

```

```
vagrant-version — ubuntu@ip-172-31-26-207: ~ -- zsh
~/Projects/Personal/cheets/capstone01/vagrant-version — ubuntu@ip-172-31-26-207: ~ -- zsh
~/Projects/Personal/cheets/catpong — zsh
~/Projects/Personal/cheets — zsh

TASK [Install docker and its dependencies] *****
changed: [node-2]

TASK [Add vagrant user to docker group] *****
changed: [node-2]

TASK [Remove swapfile from /etc/fstab] *****
ok: [node-2 => (item=swap)]
changed: [node-2 => (item=none)]

TASK [Disable swap] *****
changed: [node-2]

TASK [Add an apt signing key for Kubernetes] *****
changed: [node-2]

TASK [Adding apt repository for Kubernetes] *****
changed: [node-2]

TASK [Install Kubernetes binaries] *****
changed: [node-2]

TASK [Configure node ip] *****
changed: [node-2]

TASK [Restart kubelet] *****
changed: [node-2]

TASK [Copy the join command to server location] *****
changed: [node-2]

TASK [Join the node to cluster] *****
changed: [node-2]

RUNNING HANDLER [docker status] *****
ok: [node-2]

PLAY RECAP *****
node-2 : ok=16 changed=14 unreachable=0 failed=0 skipped=0 rescued=0 ignored=0

(cns01) c-serjik.isegholian@MACC02Z20DDLVQ vagrant-version %
```

## Take snapshot from ETCD

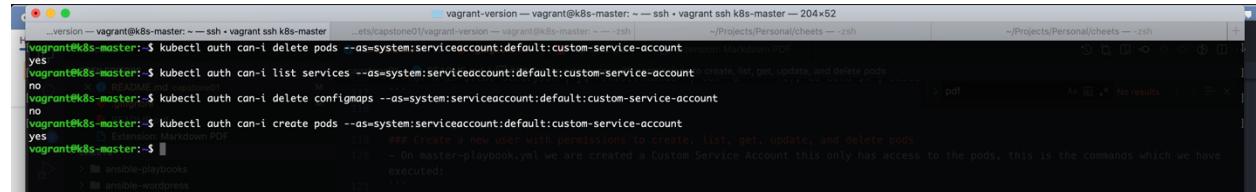
```
>> vagrant ssh k8s-master    # ssh to master node
>> kubectl get pods -n kube-system    # Check that etcd-k8s-master is there and running
# Grab correct url for our operation
>> kubectl describe pod etcd-k8s-master -n kube-system | grep advertise
>> export advertise_url=192.168.50.10:2379
# Take the snapshot
>> sudo ETCDCCTL_API=3 etcdctl --endpoints $advertise_url \
--cacert /etc/kubernetes/pki/etcd/ca.crt --key /etc/kubernetes/pki/etcd/server.key \
--cert /etc/kubernetes/pki/etcd/server.crt get "" --prefix=true -w json > etcd.json
# See what we have got on etcd:
>> for k in $(cat etcd.json | jq '.kvs[].key' | cut -d '"' -f2); do echo $k | base64 --decode; echo; done
>> for k in $(cat etcd.json | jq '.kvs[].value' | cut -d '"' -f2); do echo $k | base64 --decode; echo; done
```

## **Check Keys and values inside snapshot**

## Check Custom Service Account permissions

We have created our custom-cluster-role and custom-service-account as part of master-playbook.yml.

```
- name: Create Custom Roles and Service Account
  become: false
  shell: |
    kubectl create clusterrole custom-cluster-role --verb=list --verb=get --verb=watch --verb=update --verb=delete --verb=create --
resource=pods
    kubectl create serviceaccount custom-service-account
    kubectl create clusterrolebinding custom-clusterrole-binding --clusterrole=custom-cluster-role --serviceaccount=default:custom-service-
account
```



```
vagrant@k8s-master: ~ -- ssh + vagrant ssh k8s-master ~ -- ssh + vagrant ssh k8s-master ~ - 204x52
...version -- vagrant@k8s-master: ~ -- ssh + vagrant ssh k8s-master ~ -- ssh + vagrant@k8s-master: ~ -- ssh ... /etc/cassandra/vagrant-version -- vagrant@k8s-master: ~ -- ssh ... /Projects/Personal/cheats -- zsh
vagrant@k8s-master: $ kubectl auth can-i delete pods --as=system:serviceaccount:default:custom-service-account
yes
vagrant@k8s-master: $ kubectl auth can-i list services --as=system:serviceaccount:default:custom-service-account
create, list, get, update, and delete pods
no
vagrant@k8s-master: $ kubectl auth can-i delete configmaps --as=system:serviceaccount:default:custom-service-account
no
vagrant@k8s-master: $ kubectl auth can-i create pods --as=system:serviceaccount:default:custom-service-account
yes
  ↳ Extended Markdown PDF
  ↳ Create a new user with permissions to create, list, get, update, and delete pods
vagrant@k8s-master: $ [1] 179
  ↳ On master-playbook.yml we are created a Custom Service Account this only has access to the pods, this is the commands which we have
executed:
  ↳ ...
  ↳ ansible-playbooks
  ↳ ansible-wordpress
  ↳ ...
  ↳ ...
```

## Load Generate and Auto Scaling

We have created a 2 deployments for flaskapp and mysql, plus services for each, NetworkPolicy for mysql deployment and HorizontalPodAutoScaler for flaskapp. The all run as part of our master-playbook.yml.

```
- name: Copy deployment files
  become: false
  copy:
    src: ./Kube-deploy
    dest: ./

- name: Deploy application
  become: false
  shell: |
    cd ${pwd}/kube-deploy
    kubectl apply -k ./
```

The kube-deploy contains yaml files for Kubernetes.

Kustomization.yaml

```
secretGenerator:
- name: mysql-pass
  literals:
  - password=centos
resources:
- mysql-deployment.yaml
- flaskapp-deployment.yaml
```

mysql-deployment.yaml

```
apiVersion: apps/v1 # for k8s versions before 1.9.0 use apps/v1beta2 and before 1.8.0 use extensions/v1beta1
kind: Deployment
metadata:
  name: flask-mysql
  labels:
    app: fk-mysql
spec:
  selector:
    matchLabels:
      app: fk-mysql
  strategy:
    type: Recreate
  template:
    metadata:
      labels:
        app: fk-mysql
    spec:
      containers:
      - image: mysql:5.6
        name: mysql
        env:
        - name: MYSQL_ROOT_PASSWORD
          valueFrom:
            secretKeyRef:
              name: mysql-pass
              key: password
        livenessProbe:
          tcpSocket:
            port: 3306
        ports:
        - containerPort: 3306
          name: mysql
      ---  

apiVersion: v1
kind: Service
metadata:
```

```

name: flask-mysql
labels:
  app: fk-mysql
spec:
  ports:
    - port: 3306
  selector:
    app: fk-mysql
  clusterIP: None
  ----

kind: NetworkPolicy
apiVersion: networking.k8s.io/v1
metadata:
  name: flask-mysql
spec:
  podSelector:
    matchLabels:
      app: fk-mysql
  ingress:
    - from:
        - podSelector:
            matchLabels:
              app: fk-frontend

```

```

flaskapp-deployment.yaml
apiVersion: apps/v1 # for k8s versions before 1.9.0 use apps/v1beta2 and before 1.8.0 use extensions/v1beta1
kind: Deployment
metadata:
  name: flaskapp
  labels:
    app: fk-frontend
spec:
  replicas: 1
  selector:
    matchLabels:
      app: fk-frontend
  strategy:
    type: Recreate
  template:
    metadata:
      labels:
        app: fk-frontend
    spec:
      containers:
        - image: serjik1024/flaskapp:1.0
          name: flaskapp
          env:
            - name: DB_HOST
              value: flask-mysql
            - name: DB_PASSWORD
              valueFrom:
                secretKeyRef:
                  name: mysql-pass
                  key: password
          ports:
            - containerPort: 5000
              name: flaskapp
          resources:
            limits:
              cpu: 500m
            requests:
              cpu: 200m
  status: {}
  ----

apiVersion: v1
kind: Service
metadata:
  name: flaskapp
  labels:
    app: fk-frontend
spec:
  ports:
    - port: 5000
      protocol: TCP
      targetPort: 5000
  selector:
    app: fk-frontend
  type: NodePort
  status:
    loadBalancer: {}

  ----

apiVersion: autoscaling/v1
kind: HorizontalPodAutoscaler
metadata:
  creationTimestamp: null
  name: flaskapp
spec:
  maxReplicas: 3
  minReplicas: 1
  scaleTargetRef:
    apiVersion: apps/v1
    kind: Deployment
    name: flaskapp

```

```
targetCPUUtilizationPercentage: 50
status:
  currentReplicas: 0
  desiredReplicas: 0
```

this is the output of our application with load generator: