

CS571
Mansi Shah
19526

7.4 Decoupling configuration with a ConfigMap

Step-1: Different ways to create ConfigMap

- a) Using the kubectl create configmap command and display yaml.

```
mansishah@macbookpro fortune-env % kubectl create configmap fortune-config --from-literal=sleep-interval=25
configmap/fortune-config created
mansishah@macbookpro fortune-env % kubectl get configmap fortune-config -o yaml
apiVersion: v1
data:
  sleep-interval: "25"
kind: ConfigMap
metadata:
  creationTimestamp: "2020-03-21T03:23:30Z"
  name: fortune-config
  namespace: default
  resourceVersion: "48008"
  selfLink: /api/v1/namespaces/default/configmaps/fortune-config
  uid: 07dc6b80-bff9-464f-b09b-5d0dd7dd54dc
mansishah@macbookpro fortune-env % ls
Dockerfile          fortune-pod-env.yaml    fortuneloop.sh
mansishah@macbookpro fortune-env % kubectl get configmap
NAME        DATA   AGE
fortune-config 1      6m43s
mansishah@macbookpro fortune-env %
```

- b) Creating a ConfigMap entry from yaml.

```
mansishah@macbookpro fortune-env % vim fortune-config.yaml
mansishah@macbookpro fortune-env % cat fortune-config.yaml
apiVersion: v1
kind: ConfigMap
metadata:
  name: fortune-config
data:
  sleep-interval: "25"
mansishah@macbookpro fortune-env % kubectl create -f fortune-config.yaml
configmap/fortune-config created
mansishah@macbookpro fortune-env % kubectl get configmap
NAME        DATA   AGE
fortune-config 1      13s
mansishah@macbookpro fortune-env %
```

c) Creating a ConfigMap entry from the contents of a file

```
mansishah@macbookpro fortune-env % vim config-file.conf
mansishah@macbookpro fortune-env % cat config-file.conf
apiVersion: v1
kind: ConfigMap
metadata:
  name: fortune-config
data:
  sleep-interval: "25"
mansishah@macbookpro fortune-env % kubectl create configmap my-config --from-file=customkey=config-file.conf
configmap/my-config created
mansishah@macbookpro fortune-env % kubectl get configmap
NAME      DATA   AGE
my-config  1      9s
mansishah@macbookpro fortune-env % kubectl get configmap my-config -o yaml
apiVersion: v1
data:
  customkey: |
    apiVersion: v1
    kind: ConfigMap
    metadata:
      name: fortune-config
    data:
      sleep-interval: "25"
kind: ConfigMap
metadata:
  creationTimestamp: "2020-03-21T08:19:52Z"
  name: my-config
  namespace: default
  resourceVersion: "51980"
  selfLink: /api/v1/namespaces/default/configmaps/my-config
  uid: 5942edd6-50a5-46bf-b61a-fac83db06181
mansishah@macbookpro fortune-env % []
```

d) Creating a ConfigMap from files in a directory

```
mansishah@macbookpro fortune-env % mkdir configDir
mansishah@macbookpro fortune-env % cd configDir
mansishah@macbookpro configDir % vim config-file.yaml
mansishah@macbookpro configDir % cat config-file.yaml
apiVersion: v1
kind: ConfigMap
metadata:
  name: fortune-config-dir
data:
  sleep-interval: "25"
mansishah@macbookpro configDir % kubectl create configmap my-config-dir --from-file=/Users/mansishah/cloudcomputing/fortune-env/configDir
configmap/my-config-dir created
mansishah@macbookpro configDir % kubectl get configmap
NAME      DATA   AGE
my-config  1      9m10s
my-config-dir 1      10s
mansishah@macbookpro configDir % kubectl get configmap my-config-dir -o yaml
apiVersion: v1
data:
  config-file.yaml: |
    apiVersion: v1
    kind: ConfigMap
    metadata:
      name: fortune-config-dir
    data:
      sleep-interval: "25"
kind: ConfigMap
metadata:
  creationTimestamp: "2020-03-21T08:28:52Z"
  name: my-config-dir
  namespace: default
  resourceVersion: "53158"
  selfLink: /api/v1/namespaces/default/configmaps/my-config-dir
  uid: c791a31f-41e2-4867-897f-9e64e3ac728d
mansishah@macbookpro configDir % []
```

e) Combining different options

```
mansishah@macbookpro fortune-env % vim foo.json
mansishah@macbookpro fortune-env % cat foo.json
{
    "foo": "bar"
    "baz": 5
}
mansishah@macbookpro fortune-env % mkdir config-opts
mansishah@macbookpro fortune-env % cd config-opts
mansishah@macbookpro config-opts % echo "true" > debug
mansishah@macbookpro config-opts % echo "100" > repeat
mansishah@macbookpro config-opts % cat debug
true
mansishah@macbookpro config-opts % cat repeat
100
mansishah@macbookpro config-opts % cd ../
mansishah@macbookpro fortune-env % echo "abc" > footer.conf
```

```
mansishah@macbookpro fortune-env % kubectl create configmap my-config --from-file=foo.json --from-file=bar=footer.conf --from-file=config-opts/ --from-literal=some=thing
configmap/my-config created
mansishah@macbookpro fortune-env % kubectl get config my-config -o yaml
error: the server doesn't have a resource type "config"
mansishah@macbookpro fortune-env % kubectl get configmap my-config -o yaml
apiVersion: v1
data:
  bar: I
    abc
  debug: I
    true
  foo.json: I
    {
      "foo": "bar"
      "baz": 5
    }
  repeat: I
    100
  some: thing
kind: ConfigMap
metadata:
  creationTimestamp: "2020-03-21T08:58:31Z"
  name: my-config
  namespace: default
  resourceVersion: "57126"
  selfLink: /api/v1/namespaces/default/configmaps/my-config
  uid: f95aba3a-999b-42f9-a8fb-f49b79144e8e
mansishah@macbookpro fortune-env %
```

Step-2: Passing a ConfigMap entry to a container as an environment variable

```
mansishah@macbookpro fortune-env % kubectl get configmap
NAME          DATA   AGE
fortune-config 1      2m15s
mansishah@macbookpro fortune-env % kubectl get configmap fortune-config -o yaml
apiVersion: v1
data:
  sleep-interval: "25"
kind: ConfigMap
metadata:
  creationTimestamp: "2020-03-21T08:36:18Z"
  name: fortune-config
  namespace: default
  resourceVersion: "54169"
  selfLink: /api/v1/namespaces/default/configmaps/fortune-config
  uid: 106f00ea-3930-4f7d-8914-e1be214c1097
```

```
mansishah@macbookpro fortune-env % vim fortune-pod-env-configmap.yaml
mansishah@macbookpro fortune-env % cat fortune-pod-env-configmap.yaml
apiVersion: v1
kind: Pod
metadata:
  name: fortune-env-from-configmap
spec:
  containers:
    - image: mansi2210/shahm888:fortune_env
      env:
        - name: INTERVAL
          valueFrom:
            configMapKeyRef:
              name: fortune-config
              key: sleep-interval
      name: html-generator
      volumeMounts:
        - name: html
          mountPath: /var/htdocs
    - image: nginx:alpine
      name: web-server
      volumeMounts:
        - name: html
          mountPath: /usr/share/nginx/html
          readOnly: true
      ports:
        - containerPort: 80
          protocol: TCP
      volumes:
        - name: html
          emptyDir: {}
mansishah@macbookpro fortune-env % kubectl create -f fortune-pod-env-configmap.yaml
pod/fortune-env-from-configmap created
mansishah@macbookpro fortune-env % kubectl get po
NAME                  READY   STATUS    RESTARTS   AGE
fortune-env-from-configmap   2/2     Running   0          14s
mansishah@macbookpro fortune-env %
```

Logs to prove:

```
mansishah@macbookpro fortune-env % kubectl logs fortune-env-from-configmap -c html-generator
Configured to generate new fortune every 25 seconds
Sat Mar 21 08:41:43 UTC 2020 Writing fortune to /var/htdocs/index.html
Sat Mar 21 08:42:08 UTC 2020 Writing fortune to /var/htdocs/index.html
Sat Mar 21 08:42:33 UTC 2020 Writing fortune to /var/htdocs/index.html
Sat Mar 21 08:42:58 UTC 2020 Writing fortune to /var/htdocs/index.html
Sat Mar 21 08:43:23 UTC 2020 Writing fortune to /var/htdocs/index.html
mansishah@macbookpro fortune-env %
```

Step-3: Passing all entries of a ConfigMap as environment variables at once

```
mansishah@macbookpro fortune-env % vim my-config-map.yaml
mansishah@macbookpro fortune-env % cat my-config-map.yaml
apiVersion: v1
kind: ConfigMap
metadata:
  name: my-config-map
data:
  CONFIG_FOO: "foo"
  CONFIG_BAR: "bar"
mansishah@macbookpro fortune-env % kubectl create configmap my-config-map --from-file=my-config-map.yaml
configmap/my-config-map created
mansishah@macbookpro fortune-env %
```

```
mansishah@macbookpro fortune-env % kubectl get configmap my-config-map -o yaml
apiVersion: v1
data:
  my-config-map.yaml: |
    apiVersion: v1
    kind: ConfigMap
    metadata:
      name: my-config-map
    data:
      CONFIG_FOO: "foo"
      CONFIG_BAR: "bar"
kind: ConfigMap
metadata:
  creationTimestamp: "2020-03-21T09:07:27Z"
  name: my-config-map
  namespace: default
  resourceVersion: "58294"
  selfLink: /api/v1/namespaces/default/configmaps/my-config-map
  uid: 241a6f44-9265-413a-b42e-2ce253970e99
```

Step-4: Passing a ConfigMap entry as a command-line argument

```
mansishah@macbookpro fortune-env % vim fortune-pod-args-configmap.yaml
mansishah@macbookpro fortune-env % cat fortune-pod-args-configmap.yaml
apiVersion: v1
kind: Pod
metadata:
  name: fortune-args-from-configmap
spec:
  containers:
    - image: mansi2210/shahm888:fortune_args
      env:
        - name: INTERVAL
          valueFrom:
            configMapKeyRef:
              name: fortune-config
              key: sleep-interval
      args: ["$(INTERVAL)"]
      name: html-generator
      volumeMounts:
        - name: html
          mountPath: /var/htdocs
    - image: nginx:alpine
      name: web-server
      volumeMounts:
        - name: html
          mountPath: /usr/share/nginx/html
          readOnly: true
      ports:
        - containerPort: 80
          protocol: TCP
      volumes:
        - name: html
          emptyDir: {}
mansishah@macbookpro fortune-env % kubectl create -f fortune-pod-args-configmap.yaml
pod/fortune-args-from-configmap created
mansishah@macbookpro fortune-env % kubectl get po
NAME                  READY   STATUS    RESTARTS   AGE
fortune-args-from-configmap   2/2     Running   0          14s
mansishah@macbookpro fortune-env %
mansishah@macbookpro fortune-env % kubectl get configmap fortune-config -o yaml
apiVersion: v1
data:
  Sleep-interval: "25"
kind: ConfigMap
metadata:
  creationTimestamp: "2020-03-21T08:36:18Z"
  name: fortune-config
  namespace: default
  resourceVersion: "54169"
  selfLink: /api/v1/namespaces/default/configmaps/fortune-config
mansishah@macbookpro fortune-env % kubectl logs fortune-args-from-configmap -c html-generator
Configured to generate new fortune every 25 seconds
Sat Mar 21 09:13:00 UTC 2020 Writing fortune to /var/htdocs/index.html
Sat Mar 21 09:13:25 UTC 2020 Writing fortune to /var/htdocs/index.html
Sat Mar 21 09:13:50 UTC 2020 Writing fortune to /var/htdocs/index.html
Sat Mar 21 09:14:15 UTC 2020 Writing fortune to /var/htdocs/index.html
Sat Mar 21 09:14:40 UTC 2020 Writing fortune to /var/htdocs/index.html
mansishah@macbookpro fortune-env %
```

Step-5: Using a configMap volume to expose ConfigMap entries as files

a) Creating the ConfigMap

```
mansishah@macbookpro configmap-files % cat my-nginx-config.conf
server {
    listen          80;
    server_name     www.kubia-example.com;

    gzip on;
    gzip_types text/plain application/xml;

    location / {
        root   /usr/share/nginx/html;
        index  index.html index.htm;
    }
}
mansishah@macbookpro configmap-files % cat sleep-interval
25
mansishah@macbookpro fortune-env % kubectl create configmap fortune-config --from-file=configmap-files
configmap/fortune-config created
mansishah@macbookpro fortune-env % kubectl get configmap fortune-config -o yaml
apiVersion: v1
data:
my-nginx-config.conf: |
  server {
    listen          80;
    server_name     www.kubia-example.com;

    gzip on;
    gzip_types text/plain application/xml;

    location / {
        root   /usr/share/nginx/html;
        index  index.html index.htm;
    }
}
sleep-interval: |
  25
kind: ConfigMap
metadata:
  creationTimestamp: "2020-03-21T09:22:14Z"
  name: fortune-config
  namespace: default
  resourceVersion: "60238"
  selfLink: /api/v1/namespaces/default/configmaps/fortune-config
  uid: 51a3789e-5f79-433c-9a65-a7052674545e
mansishah@macbookpro fortune-env % █
```

b) Using the ConfigMap's entries in a volume

```
mansishah@macbookpro fortune-env % cat fortune-pod-configmap-volume.yaml
apiVersion: v1
kind: Pod
metadata:
  name: fortune-configmap-volume
spec:
  containers:
    - image: mansi2210/shahm888:fortune_env
      env:
        - name: INTERVAL
          valueFrom:
            configMapKeyRef:
              name: fortune-config
              key: sleep-interval
      name: html-generator
      volumeMounts:
        - name: html
          mountPath: /var/htdocs
    - image: nginx:alpine
      name: web-server
      volumeMounts:
        - name: html
          mountPath: /usr/share/nginx/html
          readOnly: true
        - name: config
          mountPath: /etc/nginx/conf.d
          readOnly: true
        - name: config
          mountPath: /tmp/whole-fortune-config-volume
          readOnly: true
      ports:
        - containerPort: 80
          name: http
          protocol: TCP
    volumes:
      - name: html
        emptyDir: {}
      - name: config
        configMap:
          name: fortune-config
mansishah@macbookpro fortune-env % kubectl create -f fortune-pod-configmap-volume.yaml
pod/fortune-configmap-volume created
mansishah@macbookpro fortune-env % kubectl get pod fortune-configmap-volume
NAME           READY   STATUS    RESTARTS   AGE
fortune-configmap-volume   2/2     Running   0          25s
mansishah@macbookpro fortune-env % kubectl logs fortune-configmap-volume -c html-generator
Configured to generate new fortune every 25 seconds
Sat Mar 21 09:25:16 UTC 2020 Writing fortune to /var/htdocs/index.html
Sat Mar 21 09:25:41 UTC 2020 Writing fortune to /var/htdocs/index.html
Sat Mar 21 09:26:06 UTC 2020 Writing fortune to /var/htdocs/index.html
mansishah@macbookpro fortune-env % kubectl port-forward fortune-configmap-volume 8080:80 &
[1] 25622
mansishah@macbookpro fortune-env % Forwarding from 127.0.0.1:8080 -> 80
Forwarding from [::1]:8080 -> 80
mansishah@macbookpro fortune-env % curl -H "Accept-Encoding: gzip" -I localhost:8080
Handling connection for 8080
HTTP/1.1 200 OK
Server: nginx/1.17.9
Date: Sat, 21 Mar 2020 09:27:50 GMT
Content-Type: text/html
Last-Modified: Sat, 21 Mar 2020 09:27:46 GMT
Connection: keep-alive
ETag: W/"5e75de12-4f"
Content-Encoding: gzip
mansishah@macbookpro fortune-env % kubectl exec fortune-configmap-volume -c web-server ls /etc/nginx/conf.d
my-nginx-config.conf
sleep-interval
mansishah@macbookpro fortune-env % []
```

c) Exposing certain ConfigMap entries in the volume

```
mansishah@macbookpro fortune-env % vim fortune-pod-configmap-volume-with-items.yaml
mansishah@macbookpro fortune-env % cat fortune-pod-configmap-volume-with-items.yaml
apiVersion: v1
kind: Pod
metadata:
  name: fortune-configmap-volume-with-items
spec:
  containers:
    - image: mansi2210/shahm888:fortune_env
      name: html-generator
      volumeMounts:
        - name: html
          mountPath: /var/htdocs
    - image: nginx:alpine
      name: web-server
      volumeMounts:
        - name: html
          mountPath: /usr/share/nginx/html
          readOnly: true
        - name: config
          mountPath: /etc/nginx/conf.d/
          readOnly: true
      ports:
        - containerPort: 80
          protocol: TCP
  volumes:
    - name: html
      emptyDir: {}
    - name: config
      configMap:
        name: fortune-config
        items:
          - key: my-nginx-config.conf
            path: gzip.conf
```

```
mansishah@macbookpro fortune-env % kubectl get pod
NAME                           READY   STATUS    RESTARTS   AGE
fortune-args-from-configmap   2/2     Running   0          21m
fortune-configmap-volume      2/2     Running   0          9m2s
fortune-configmap-volume-with-items 2/2     Running   0          2m11s
mansishah@macbookpro fortune-env %
```

d) Setting file permissions

```
mansishah@macbookpro fortune-env % cat fortune-pod-configmap-volume-defaultMode.yaml
apiVersion: v1
kind: Pod
metadata:
  name: fortune-configmap-volume
spec:
  containers:
    - image: luksa/fortune:env
      env:
        - name: INTERVAL
          valueFrom:
            configMapKeyRef:
              name: fortune-config
              key: sleep-interval
      name: html-generator
    volumeMounts:
      - name: html
        mountPath: /var/htdocs
  - image: nginx:alpine
    name: web-server
    volumeMounts:
      - name: html
        mountPath: /usr/share/nginx/html
        readOnly: true
      - name: config
        mountPath: /etc/nginx/conf.d
        readOnly: true
      - name: config
        mountPath: /tmp/whole-fortune-config-volume
        readOnly: true
  volumes:
    - name: html
      emptyDir: {}
    - name: config
      configMap:
        name: fortune-config
        defaultMode: 0660
mansishah@macbookpro fortune-env % kubectl create -f fortune-pod-configmap-volume-defaultMode.yaml
pod/fortune-configmap-volume created
mansishah@macbookpro fortune-env % kubectl get po
NAME                  READY   STATUS      RESTARTS   AGE
fortune-configmap-volume   0/2     ContainerCreating   0          11s
mansishah@macbookpro fortune-env % kubectl get po
NAME                  READY   STATUS      RESTARTS   AGE
fortune-configmap-volume   2/2     Running   0          17s
```

Step-6: Updating an app's config without having to restart the app

a) Editing a ConfigMap

```
mansishah@macbookpro fortune-env % kubectl edit configmap fortune-config
configmap/fortune-config edited
mansishah@macbookpro fortune-env % kubectl get fortune-config -o yaml
error: the server doesn't have a resource type "fortune-config"
mansishah@macbookpro fortune-env % kubectl get configmap fortune-config -o yaml
apiVersion: v1
data:
  my-nginx-config.conf: |
    server {
      listen          80;
      server_name     www.kubia-example.com;

      gzip off;
      gzip_types text/plain application/xml;

      location / {
        root   /usr/share/nginx/html;
        index  index.html index.htm;
      }
    }
    sleep-interval: |
      25
kind: ConfigMap
metadata:
  creationTimestamp: "2020-03-21T09:22:14Z"
  name: fortune-config
  namespace: default
  resourceVersion: "63392"
  selfLink: /api/v1/namespaces/default/configmaps/fortune-config
  uid: 51a3789e-5f79-433c-9a65-a7052674545e
```

```
mansishah@macbookpro fortune-env % kubectl exec fortune-configmap-volume -c web-server cat /etc/nginx/conf.d/my-nginx-config.conf
server {
  listen          80;
  server_name     www.kubia-example.com;

  gzip off;
  gzip_types text/plain application/xml;

  location / {
    root   /usr/share/nginx/html;
    index  index.html index.htm;
  }
}
```

b) Signaling Nginx to reload the config

c) Understanding how the files are updated atomically

```
mansishah@macbookpro fortune-env % kubectl exec fortune-configmap-volume -c web-server -- nginx -s reload
2020/03/21 09:48:10 [notice] 18#18: signal process started
mansishah@macbookpro fortune-env % kubectl exec -it fortune-configmap-volume -c web-server -- ls -lA /etc/nginx/conf.d
total 4
drwxr-xr-x    2 root      root            4096 Mar 21 09:46 ..2020_03_21_09_46_20.872432480
lrwxrwxrwx    1 root      root            31 Mar 21 09:46 ..data -> ..2020_03_21_09_46_20.872432480
lrwxrwxrwx    1 root      root            27 Mar 21 09:43 my-nginx-config.conf -> ..data/my-nginx-config.conf
lrwxrwxrwx    1 root      root            21 Mar 21 09:43 sleep-interval -> ..data/sleep-interval
mansishah@macbookpro fortune-env %
```