Helm LAB

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Helm LAB

Benefits:

- Improves productivity
- Reduces the complexity of deployments of microservices
- Enables the adaptation of cloud native applications

Terminologies:

- **Chart**: A package of pre-configured Kubernetes resources.
- **Release**: A specific instance of a chart which has been deployed to the cluster using Helm.
- **Repository**: A group of published charts which can be made available to others.

Objectives:

- Helm Installation
- Commands
- Repo create
  - Charts and templates
  - Values
- Repo update
- Rollback

Installation:

1. **Download Helm Tar file**

 # wget https://get.helm.sh/helm-v3.5.0-rc.2-linux-amd64.tar.gz

```
[root@master ~]# wget https://get.helm.sh/helm-v3.5.0-rc.2-linux-amd64.tar.gz
--2021-01-13 23:09:50--  https://get.helm.sh/helm-v3.5.0-rc.2-linux-amd64.tar.gz
Resolving get.helm.sh (get.helm.sh)... 152.199.39.108, 2606:2800:247:1cb7:261b:1f9c:2074:3c
Connecting to get.helm.sh (get.helm.sh)|152.199.39.108|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 12328121 (12M) [application/x-tar]
Saving to: âhelm-v3.5.0-rc.2-linux-amd64.tar.gzâ

100%[=======================================================================================>] 12,328,121  2.32MB/s   in 5.1s

2021-01-13 23:09:55 (2.33 MB/s) - âhelm-v3.5.0-rc.2-linux-amd64.tar.gzâ saved [12328121/12328121]
```

2. **Extract Tar file**

 # tar xvf helm-v3.5.0-rc.2-linux-amd64.tar.gz

```
[root@master ~]# tar xvf helm-v3.5.0-rc.2-linux-amd64.tar.gz
linux-amd64/
linux-amd64/helm
linux-amd64/LICENSE
linux-amd64/README.md
```

3. **Change directory to linux-amd64**

 # cd linux-amd64

```
[root@master ~]# cd linux-amd64/
[root@master linux-amd64]#
[root@master linux-amd64]#
[root@master linux-amd64]# ls -ltrh
total 38M
-rwxr-xr-x. 1 3434 3434  38M Jan  6 23:38 helm
-rw-r--r--. 1 3434 3434 3.3K Jan  6 23:38 README.md
-rw-r--r--. 1 3434 3434  12K Jan  6 23:38 LICENSE
```

4. **Move helm binary to /usr/local/bin**

 # mv helm /usr/local/bin

```
[root@master linux-amd64]# mv helm /usr/local/bin/
[root@master linux-amd64]#
```

5. **Check if helm command is available**

 # which helm

```
[root@master linux-amd64]# which helm
/usr/local/bin/helm
```

6. **Check Helm Version**

 # helm version

```
[root@master linux-amd64]# helm version
version.BuildInfo{Version:"v3.5.0-rc.2", GitCommit:"32c22239423b3b4ba6706d450bd044baffdcf9e6", GitTreeState:"clean", GoVersion:"go1.15.6"}
```

7. **Check Helm Version in short**

 # helm version --short --client

```
[root@master linux-amd64]# helm version --short --client
v3.5.0-rc.2+g32c2223
```

Helm Commands:

1. **Helm help**

 # helm help |less

```
[root@master ~]# helm help |less
The Kubernetes package manager

Common actions for Helm:

- helm search:    search for charts
- helm pull:      download a chart to your local directory to view
- helm install:   upload the chart to Kubernetes
- helm list:      list releases of charts
```

```
  helm [command]

Available Commands:
  completion  generate autocompletion scripts for the specified shell
  create      create a new chart with the given name
  dependency  manage a chart's dependencies
  env         helm client environment information
  get         download extended information of a named release
  help        Help about any command
  history     fetch release history
  install     install a chart
  lint        examine a chart for possible issues
  list        list releases
  package     package a chart directory into a chart archive
  plugin      install, list, or uninstall Helm plugins
  pull        download a chart from a repository and (optionally) unpack it in local directory
  repo        add, list, remove, update, and index chart repositories
  rollback    roll back a release to a previous revision
  search      search for a keyword in charts
  show        show information of a chart
  status      display the status of the named release
  template    locally render templates
  test        run tests for a release
  uninstall   uninstall a release
  upgrade     upgrade a release
  verify      verify that a chart at the given path has been signed and is valid
  version     print the client version information
```

2. **Helm repo list**

 # helm repo list

```
[root@master ~]# helm repo list
NAME    URL
stable  https://charts.helm.sh/stable
```

3. **Helm list**

 # helm list

```
[root@master ~]# helm list
NAME    NAMESPACE       REVISION        UPDATED STATUS  CHART   APP VERSION
```

Helm Repo

4. Helm add and update repo

```
[root@master ~]# helm repo add stable https://charts.helm.sh/stable
"stable" has been added to your repositories
[root@master ~]#
```

 # helm repo update

```
[root@master ~]# helm repo update
Hang tight while we grab the latest from your chart repositories...
...Successfully got an update from the "stable" chart repository
Update Complete. âHappy Helming!â
```

5. **Helm Search Repo for charts**

#helm search repo <chartname> (**by default search into added repos**)

 # helm search repo nginx-ingress

```
[root@master ~]# helm search repo nginx-ingress
NAME                    CHART VERSION   APP VERSION     DESCRIPTION
stable/nginx-ingress    1.41.3          v0.34.1         DEPRECATED! An nginx Ingress controller that us...
stable/nginx-lego       0.3.1                           Chart for nginx-ingress-controller and kube-lego
```

6. Helm Show Chart

 # helm show chart stable/nginx-lego

```
[root@master ~]# helm show chart stable/nginx-lego
apiVersion: v1
deprecated: true
description: Chart for nginx-ingress-controller and kube-lego
keywords:
- kube-lego
- nginx-ingress-controller
- nginx
- letsencrypt
maintainers:
- email: jack.zampolin@gmail.com
  name: Jack Zampolin
name: nginx-lego
sources:
- https://github.com/kubernetes/contrib/tree/master/ingress/controllers/nginx
- https://github.com/jetstack/kube-lego/tree/master/examples/nginx
version: 0.3.1
```

7. Download chart

 # helm fetch stable/nginx-lego

```
[root@master ~]# helm fetch stable/nginx-lego
[root@master ~]#
[root@master ~]# ls -tlrh |grep nginx-lego
-rw-r--r--. 1 root root 3.8K Jan 14 23:14 nginx-lego-0.3.1.tgz
```

Watch content by untar and viewing file

 # tar zxf nginx-lego-0.3.1.tgz

```
[root@master ~]# tar zxf nginx-lego-0.3.1.tgz
tar: nginx-lego/Chart.yaml: implausibly old time stamp 1970-01-01 05:30:00
tar: nginx-lego/values.yaml: implausibly old time stamp 1970-01-01 05:30:00
tar: nginx-lego/templates/NOTES.txt: implausibly old time stamp 1970-01-01 05:30:00
tar: nginx-lego/templates/_helpers.tpl: implausibly old time stamp 1970-01-01 05:30:00
tar: nginx-lego/templates/default-deployment.yaml: implausibly old time stamp 1970-01-01 05:30:00
tar: nginx-lego/templates/default-service.yaml: implausibly old time stamp 1970-01-01 05:30:00
tar: nginx-lego/templates/lego-configmap.yaml: implausibly old time stamp 1970-01-01 05:30:00
tar: nginx-lego/templates/lego-deployment.yaml: implausibly old time stamp 1970-01-01 05:30:00
tar: nginx-lego/templates/nginx-configmap.yaml: implausibly old time stamp 1970-01-01 05:30:00
tar: nginx-lego/templates/nginx-deployment.yaml: implausibly old time stamp 1970-01-01 05:30:00
tar: nginx-lego/templates/nginx-monitoring.yaml: implausibly old time stamp 1970-01-01 05:30:00
tar: nginx-lego/templates/nginx-service.yaml: implausibly old time stamp 1970-01-01 05:30:00
tar: nginx-lego/.helmignore: implausibly old time stamp 1970-01-01 05:30:00
tar: nginx-lego/README.md: implausibly old time stamp 1970-01-01 05:30:00
```

 # cd nginx-lego

```
[root@master ~]# cd nginx-lego
[root@master nginx-lego]#
[root@master nginx-lego]#
[root@master nginx-lego]# ls -tlrh
total 12K
-rwxr-xr-x. 1 root root 2.0K Jan  1  1970 values.yaml
-rwxr-xr-x. 1 root root 2.5K Jan  1  1970 README.md
-rwxr-xr-x. 1 root root  418 Jan  1  1970 Chart.yaml
drwxr-xr-x. 2 root root  269 Jan 14 23:15 templates
```

 # tree

```
[root@master nginx-lego]# tree
.
|-- Chart.yaml
|-- README.md
|-- templates
|   |-- NOTES.txt
|   |-- _helpers.tpl
|   |-- default-deployment.yaml
|   |-- default-service.yaml
|   |-- lego-configmap.yaml
|   |-- lego-deployment.yaml
|   |-- nginx-configmap.yaml
|   |-- nginx-deployment.yaml
|   |-- nginx-monitoring.yaml
|   `-- nginx-service.yaml
`-- values.yaml

1 directory, 13 files
```

Create Helm Chart:

- Create from scratch
- Use helm

1) Create helm chart from scratch

a. Create directory named "charts" // project

This directory is repository of charts.

 # mkdir charts // <any name for your project/package dir>

```
[root@master ~]# mkdir charts
[root@master ~]#
[root@master ~]# cd charts/
[root@master charts]#
```

b. Create another directory in chart directory

This is directory for actual specific chart

 # mkdir my-nginx
 # cd my-nginx

```
[root@master charts]# mkdir my-nginx
[root@master charts]#
[root@master charts]# cd my-nginx
[root@master my-nginx]#
```

c. Create first file Chart.yaml

Note. Name **Chart.yaml** should be specific

apiVersion: v1 ----------> Mandatory Field
name: my-nginx ----------> Mandatory Field ---> Name should match with name of directory
version: 0.1.0 ----------> Mandatory Field-----> Version of Chart

appVersion: 1.0 ----------> Optional Field . Version of application --> Depends on use cases
description: My custom nginx chart ----> Optional Field -----> Description of chart.

 # Chart.yaml

```
[root@master my-nginx]# cat Chart.yaml
apiVersion: v1
name: my-nginx
version: 0.1.0
appVersion: 1.0
description: My custom nginx chart
```

d. Templates:

a. Create another directory named "templates" in my-nginx directory

b. Template directory will contain actual yaml files which are going to be deploy

 # mkdir templates

```
[root@master my-nginx]# mkdir templates
[root@master my-nginx]#
[root@master my-nginx]#
[root@master my-nginx]# cd templates/
[root@master templates]#
```

e. Create yml files for deployments

Instead creating from scratch, we will create though command line. Firstly view yaml file

 # kubectl create deploy my-nginx --image=nginx --dry-run -o yaml

```
[root@master templates]# kubectl create deploy my-nginx --image=nginx --dry-run -o yaml
W0114 23:55:32.499180   14182 helpers.go:553] --dry-run is deprecated and can be replaced with --dry-run=client.
apiVersion: apps/v1
kind: Deployment
metadata:
  creationTimestamp: null
  labels:
    app: my-nginx
  name: my-nginx
spec:
  replicas: 1
  selector:
    matchLabels:
      app: my-nginx
  strategy: {}
  template:
    metadata:
      creationTimestamp: null
      labels:
        app: my-nginx
    spec:
      containers:
      - image: nginx
        name: nginx
        resources: {}
status: {}
```

a. Redirect into deployments.yaml file

 # kubectl create deploy my-nginx --image=nginx --dry-run=client -o yaml > deployments.yml

```
[root@master templates]# kubectl create deploy my-nginx --image=nginx --dry-run=client -o yaml > deployments.yml
[root@master templates]#
[root@master templates]# ls -tlrh
total 4.0K
-rw-r--r--. 1 root root 396 Jan 14 23:57 deployments.yml
[root@master templates]#
```

g. View Directory structure

tree command in charts shows directory structure. Under my-nginx we have Chart.yml and one directory having deployments.yml

```
[root@master charts]# tree
.
`-- my-nginx
    |-- Chart.yml
    `-- templates
        `-- deployments.yml

2 directories, 2 files
```

h. Install Chart

- Go to my-nginx directory
- Open two terminal, on first terminal run helm install command and on another terminal watch kubectl get all

We used "." here because chart is present locally.

 # helm install my-nginx-chart .

```
[root@master my-nginx]# helm install my-nginx-chart .
NAME: my-nginx-chart
LAST DEPLOYED: Fri Jan 15 00:08:50 2021
NAMESPACE: default
STATUS: deployed
REVISION: 1
TEST SUITE: None
```

Second terminal output

```
Every 2.0s: kubectl get all

NAME                            READY   STATUS              RESTARTS   AGE
pod/my-nginx-6b74b79f57-s6dkt   0/1     ContainerCreating   0          34s

NAME                 TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.96.0.1    <none>        443/TCP   11d

NAME                       READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-nginx   0/1     1            0           34s

NAME                                  DESIRED   CURRENT   READY   AGE
replicaset.apps/my-nginx-6b74b79f57   1         1         0       34s
```

Verify helm list

 # helm list

```
[root@master my-nginx]# helm list
NAME            NAMESPACE       REVISION        UPDATED                                 STATUS          CHART           APP VERSION
my-nginx-chart  default         1               2021-01-15 00:08:50.156278577 +0530 IST deployed        my-nginx-0.1.0  1
```

i. Create service yaml file to expose deployment

View service yaml configuration

 # kubectl expose deploy my-nginx --port 80 --dry-run=client -o yaml

```
[root@master my-nginx]# kubectl expose deploy my-nginx --port 80 --dry-run=client -o yaml
apiVersion: v1
kind: Service
metadata:
  creationTimestamp: null
  labels:
    app: my-nginx
    app.kubernetes.io/managed-by: Helm
  name: my-nginx
spec:
  ports:
  - port: 80
    protocol: TCP
    targetPort: 80
  selector:
    app: my-nginx
status:
  loadBalancer: {}
```

Redirect to service.yaml file

 # kubectl expose deploy my-nginx --port 80 --dry-run=client -o yaml > templates/service.yml

```
[root@master my-nginx]# kubectl expose deploy my-nginx --port 80 --dry-run=client -o yaml > templates/service.yml
[root@master my-nginx]#
[root@master my-nginx]# tree
.
|-- Chart.yaml
`-- templates
    |-- deployments.yml
    `-- service.yml

1 directory, 3 files
```

j. Update Chart Version

Now we have added service.yml and our chart will be upgraded.
So ideally we should change chart version

 # cat Chart.yaml

```
[root@master my-nginx]# cat Chart.yaml
apiVersion: v1
name: my-nginx
version: 0.2.0
appVersion: 1.0
description: My custom nginx chart
```

k. Upgrade helm chart

 # helm upgrade my-nginx-chart .

```
[root@master my-nginx]# helm upgrade my-nginx-chart .
Release "my-nginx-chart" has been upgraded. Happy Helming!
NAME: my-nginx-chart
LAST DEPLOYED: Fri Jan 15 00:19:28 2021
NAMESPACE: default
STATUS: deployed
REVISION: 2
TEST SUITE: None
```

l. Verification of new service

```
Every 2.0s: kubectl get all

NAME                            READY   STATUS    RESTARTS   AGE
pod/my-nginx-6b74b79f57-s6dkt   1/1     Running   0          11m

NAME                 TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.96.0.1       <none>        443/TCP   11d
service/my-nginx     ClusterIP   10.105.147.17   <none>        80/TCP    38s

NAME                       READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-nginx   1/1     1            1           11m

NAME                                  DESIRED   CURRENT   READY   AGE
replicaset.apps/my-nginx-6b74b79f57   1         1         1       11m
```

Notice that Revision is changed to 2

 # helm list

```
[root@master my-nginx]# helm list
NAME            NAMESPACE       REVISION        UPDATED                                 STATUS          CHART           APP VERSION
my-nginx-chart  default         2               2021-01-15 00:19:28.202411035 +0530 IST deployed        my-nginx-0.2.0  1
```

m. Helm Roll Back

 # helm rollback my-nginx-chart 1

```
[root@master my-nginx]# helm rollback my-nginx-chart 1
Rollback was a success! Happy Helming!
```

Verify on second terminal that after rollback , nginx service get deleted

```
Every 2.0s: kubectl get all

NAME                            READY   STATUS    RESTARTS   AGE
pod/my-nginx-6b74b79f57-s6dkt   1/1     Running   0          14m

NAME                 TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.96.0.1    <none>        443/TCP   11d

NAME                       READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-nginx   1/1     1            1           14m

NAME                                  DESIRED   CURRENT   READY   AGE
replicaset.apps/my-nginx-6b74b79f57   1         1         1       14m
```

Rollback to revision 2 and verify on second terminal that service will reappear again

 # helm rollback my-nginx-chart 2

```
[root@master my-nginx]# helm rollback my-nginx-chart 2
Rollback was a success! Happy Helming!
```

 # kubectl get all

```
Every 2.0s: kubectl get all

NAME                            READY   STATUS    RESTARTS   AGE
pod/my-nginx-6b74b79f57-s6dkt   1/1     Running   0          16m

NAME                 TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.96.0.1       <none>        443/TCP   11d
service/my-nginx     ClusterIP   10.109.12.93    <none>        80/TCP    46s

NAME                       READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-nginx   1/1     1            1           16m

NAME                                  DESIRED   CURRENT   READY   AGE
replicaset.apps/my-nginx-6b74b79f57   1         1         1       16m
```

n. Check helm list.

Now we are in revision 4

 # helm list

```
[root@master my-nginx]# helm list
NAME            NAMESPACE       REVISION        UPDATED                                 STATUS          CHART           APP VERSION
my-nginx-chart  default         4               2021-01-15 00:24:36.376517639 +0530 IST deployed        my-nginx-0.2.0  1
```

o. Delete chart/release

 # helm uninstall my-nginx-chart

```
[root@master my-nginx]# helm uninstall my-nginx-chart
release "my-nginx-chart" uninstalled
```

Verify that all deployment, replicaset, service,pod are deleted

 # kubectl get all

```
Every 2.0s: kubectl get all

NAME                 TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.96.0.1    <none>        443/TCP   11d
```

Chart Parametrized

For parametrized chart, we will define values.yaml and define replica count in that.

 # cat values.yaml

```
[root@master my-nginx]# cat values.yaml
replicaCount: 1
```

Make sure that values.yaml file should me under my-nginx directory

```
[root@master my-nginx]# tree
.
|-- Chart.yaml
|-- templates
|   |-- deployments.yml
|   `-- service.yml
`-- values.yaml

1 directory, 4 files
```

Now we need to change deployments yaml file to replace hard coded replica count to variable

 # cat templates/deployments.yml

```
[root@master my-nginx]# cat templates/deployments.yml
apiVersion: apps/v1
kind: Deployment
metadata:
  creationTimestamp: null
  labels:
    app: my-nginx
  name: my-nginx
spec:
  replicas: {{.Values.replicaCount}}
  selector:
    matchLabels:
      app: my-nginx
  strategy: {}
  template:
    metadata:
      creationTimestamp: null
      labels:
        app: my-nginx
    spec:
      containers:
      - image: nginx
        name: nginx
        resources: {}
status: {}
```

Change revision in Charts.yaml file

 # cat Chart.yaml

```
[root@master my-nginx]# cat Chart.yaml
apiVersion: v1
name: my-nginx
version: 0.3.0
appVersion: 1.0
description: My custom nginx chart
```

Now again install chart.

Note : we don't have any pod and deployment as we have deleted chart in step No ????

 # helm install my-nginx-chart .

```
[root@master my-nginx]# helm install my-nginx-chart .
NAME: my-nginx-chart
LAST DEPLOYED: Fri Jan 15 00:43:54 2021
NAMESPACE: default
STATUS: deployed
REVISION: 1
TEST SUITE: None
```

 # kubectl get all

```
Every 2.0s: kubectl get all

NAME                            READY   STATUS    RESTARTS   AGE
pod/my-nginx-6b74b79f57-bj881   1/1     Running   0          7s

NAME                 TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.96.0.1       <none>        443/TCP   11d
service/my-nginx     ClusterIP   10.110.230.95   <none>        80/TCP    7s

NAME                       READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-nginx   1/1     1            1           7s

NAME                                  DESIRED   CURRENT   READY   AGE
replicaset.apps/my-nginx-6b74b79f57   1         1         1       7s
```

Override replicas

1) CLI - using "--set"

Firstly delete charts and verify on second terminal

 # helm uninstall my-nginx-chart
 # kubectl get all

```
[root@master my-nginx]# helm uninstall my-nginx-chart
release "my-nginx-chart" uninstalled
```

```
Every 2.0s: kubectl get all

NAME                 TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.96.0.1    <none>        443/TCP   11d
```

Change replicacount through command line.
This will not change parameter in value.yaml file.

 # helm install my-nginx-chart . --set replicaCount=2

```
[root@master my-nginx]# helm install my-nginx-chart . --set replicaCount=2
NAME: my-nginx-chart
LAST DEPLOYED: Fri Jan 15 00:47:34 2021
NAMESPACE: default
STATUS: deployed
REVISION: 1
TEST SUITE: None
```

Verify on second terminal that there are two pods now.

#kubectl get all

```
Every 2.0s: kubectl get all

NAME                            READY   STATUS    RESTARTS   AGE
pod/my-nginx-6b74b79f57-bj55q   1/1     Running   0          22s
pod/my-nginx-6b74b79f57-qpjqv   1/1     Running   0          22s

NAME                 TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.96.0.1      <none>        443/TCP   11d
service/my-nginx     ClusterIP   10.98.29.252   <none>        80/TCP    22s

NAME                       READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-nginx   2/2     2            2           22s

NAME                                  DESIRED   CURRENT   READY   AGE
replicaset.apps/my-nginx-6b74b79f57   2         2         2       22s
```

2) Customize values in Helm

Firstly delete chart

 # helm uninstall my-nginx-chart

```
[root@master my-nginx]# helm uninstall my-nginx-chart
release "my-nginx-chart" uninstalled
```

Check values through helm show command and save in /tmp/ folder

 # helm show values .
 # helm show values . > /tmp/my-nginx-values

```
[root@master my-nginx]# helm show values .
replicaCount: 2

[root@master my-nginx]# helm show values . > /tmp/my-nginx-values
```

Install chart by using that file in tmp directory

 # helm install my-nginx-chart . --values /tmp/my-nginx-values

```
[root@master my-nginx]# helm install my-nginx-chart . --values /tmp/my-nginx-values
NAME: my-nginx-chart
LAST DEPLOYED: Fri Jan 15 01:00:18 2021
NAMESPACE: default
STATUS: deployed
REVISION: 1
TEST SUITE: None
```

 # kubectl get all

```
Every 2.0s: kubectl get all

NAME                              READY   STATUS    RESTARTS   AGE
pod/my-nginx-6b74b79f57-72j4r     1/1     Running   0          17s
pod/my-nginx-6b74b79f57-mfdkt     1/1     Running   0          17s
pod/my-nginx-6b74b79f57-wrjm7     1/1     Running   0          17s

NAME                 TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.96.0.1      <none>        443/TCP   11d
service/my-nginx     ClusterIP   10.98.68.145   <none>        80/TCP    17s

NAME                       READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-nginx   3/3     3            3           17s

NAME                                    DESIRED   CURRENT   READY   AGE
replicaset.apps/my-nginx-6b74b79f57     3         3         3       17s
```

3) Helm upgrade

Without any delete and reinstallation using helm upgrade command

 # helm upgrade my-nginx-chart . --set replicaCount=4

```
[root@master my-nginx]# helm upgrade my-nginx-chart . --set replicaCount=4
Release "my-nginx-chart" has been upgraded. Happy Helming!
NAME: my-nginx-chart
LAST DEPLOYED: Fri Jan 15 01:02:49 2021
NAMESPACE: default
STATUS: deployed
REVISION: 2
TEST SUITE: None
```

Verify on second terminal that pod count is increased by 4

 # kubectl get all

```
Every 2.0s: kubectl get all

NAME                              READY   STATUS    RESTARTS   AGE
pod/my-nginx-6b74b79f57-72j4r     1/1     Running   0          3m11s
pod/my-nginx-6b74b79f57-mfdkt     1/1     Running   0          3m11s
pod/my-nginx-6b74b79f57-sqm6v     1/1     Running   0          41s
pod/my-nginx-6b74b79f57-wrjm7     1/1     Running   0          3m11s

NAME                 TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.96.0.1      <none>        443/TCP   11d
service/my-nginx     ClusterIP   10.98.68.145   <none>        80/TCP    3m11s

NAME                       READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-nginx   4/4     4            4           3m11s

NAME                                    DESIRED   CURRENT   READY   AGE
replicaset.apps/my-nginx-6b74b79f57     4         4         4       3m11s
```

Also check helm list. Revision number will also get increase

 # helm list

```
[root@master my-nginx]# helm list
NAME            NAMESPACE       REVISION        UPDATED                                 STATUS          CHART           APP VERSION
my-nginx-chart  default         2               2021-01-15 01:02:49.580544681 +0530 IST deployed        my-nginx-0.3.0  1
```

Expanded parameterized

Defining service type parameter so that user can change service type as per requirement

 # cat values.yaml

```
[root@master my-nginx]# cat values.yaml
replicaCount: 2
service:
  type: NodePort
```

Now change in services.yaml file with variable

 # cat templates/service.yml

```
[root@master my-nginx]# cat templates/service.yml
apiVersion: v1
kind: Service
metadata:
  creationTimestamp: null
  labels:
    app: my-nginx
    app.kubernetes.io/managed-by: Helm
  name: my-nginx
spec:
  type: {{.Values.service.type}}
  ports:
  - port: 80
    protocol: TCP
    targetPort: 80
  selector:
    app: my-nginx
status:
  loadBalancer: {}
```

Also change version in Chart.yaml file

 # cat Chart.yaml

```
[root@master my-nginx]# cat Chart.yaml
apiVersion: v1
name: my-nginx
version: 0.4.0
appVersion: 1.0
description: My custom nginx chart
```

Upgrade chart

 # helm upgrade my-nginx-chart .

```
[root@master my-nginx]# helm upgrade my-nginx-chart .
Release "my-nginx-chart" has been upgraded. Happy Helming!
NAME: my-nginx-chart
LAST DEPLOYED: Fri Jan 15 01:13:43 2021
NAMESPACE: default
STATUS: deployed
REVISION: 3
TEST SUITE: None
```

Verify on second terminal that service type get changed

 # kubectl get all

```
Every 2.0s: kubectl get all

NAME                              READY   STATUS    RESTARTS   AGE
pod/my-nginx-6b74b79f57-72j4r     1/1     Running   0          13m
pod/my-nginx-6b74b79f57-mfdkt     1/1     Running   0          13m
pod/my-nginx-6b74b79f57-sqm6v     1/1     Running   0          11m
pod/my-nginx-6b74b79f57-wrjm7     1/1     Running   0          13m

NAME                 TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)        AGE
service/kubernetes   ClusterIP   10.96.0.1      <none>        443/TCP        11d
service/my-nginx     NodePort    10.98.68.145   <none>        80:30429/TCP   13m

NAME                       READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-nginx   4/4     4            4           13m

NAME                                  DESIRED   CURRENT   READY   AGE
replicaset.apps/my-nginx-6b74b79f57   4         4         4       13m
```

Now we have latest version of chart

 # helm list

```
[root@master my-nginx]# helm list
NAME            NAMESPACE       REVISION        UPDATED                                 STATUS          CHART           APP VERSION
my-nginx-chart  default         3               2021-01-15 01:13:43.190800722 +0530 IST deployed        my-nginx-0.4.0  1
```

Clean Up

 # helm uninstall my-nginx-chart

```
[root@master my-nginx]# helm uninstall my-nginx-chart
release "my-nginx-chart" uninstalled
```

2) Another way to create chart - helm create command

Go back to charts directory and run helm create command

 # helm create myapp

```
[root@master my-nginx]# cd ..
[root@master charts]#
[root@master charts]#
[root@master charts]# helm create myapp
Creating myapp
```

This will create sample with directory structure.

 # tree myapp

```
[root@master charts]# tree myapp
myapp
|-- Chart.yaml
|-- charts
|-- templates
|   |-- NOTES.txt
|   |-- _helpers.tpl
|   |-- deployment.yaml
|   |-- hpa.yaml
|   |-- ingress.yaml
|   |-- service.yaml
|   |-- serviceaccount.yaml
|   `-- tests
|       `-- test-connection.yaml
`-- values.yaml
```

Set up local Helm Chart Repository

Check Directory structure of chart

 # tree charts

```
[root@master ~]# tree charts
charts
|-- my-nginx
|   |-- Chart.yaml
|   |-- templates
|   |   |-- deployments.yml
|   |   `-- service.yml
|   `-- values.yaml
```

Package chart

It will create tgz tar file with package name

 # cd charts
 # helm package my-nginx

```
[root@master ~]# cd charts/
[root@master charts]#
[root@master charts]# helm package my-nginx
Successfully packaged chart and saved it to: /root/charts/my-nginx-0.4.0.tgz
```

```
drwxr-xr-x. 3 root root  60 Jan 15 01:13 my-nginx
-rw-r--r--. 1 root root 615 Jan 16 13:16 my-nginx-0.4.0.tgz
```

Serving on webserver

In V2 we have helm serve command (local web server) but in V3 it is removed. So we need to achieve this through **chartmuseum** web server.

Install Chartmuseum

 # curl -LO https://s3.amazonaws.com/chartmuseum/release/latest/bin/linux/amd64/chartmuseum

```
[root@master ~]# curl -LO https://s3.amazonaws.com/chartmuseum/release/latest/bin/linux/amd64/chartmuseum
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 52.5M  100 52.5M    0     0  1935k      0  0:00:27  0:00:27 --:--:-- 2224k
```

Change permission of chartmuseum binary

 # chmod +x ./chartmuseum

```
[root@master ~]# ls -tlrh chartmuseum
-rw-r--r--. 1 root root 53M Jan 16 14:13 chartmuseum
[root@master ~]#
[root@master ~]# chmod +x ./chartmuseum
```

Move chartmuseum binary to /usr/local/bin

 # mv ./chartmuseum /usr/local/bin

```
[root@master ~]# mv ./chartmuseum /usr/local/bin
mv: overwrite '/usr/local/bin/chartmuseum'? yes
```

Run chartmuseum process with port and storage location argument

 # chartmuseum --debug --port=8080 --storage="local" --storage-local-rootdir="/root/charts"

```
[root@master ~]# chartmuseum --debug --port=8080 --storage="local" --storage-local-rootdir="/root/charts"
2021-01-16T14:15:44.481+0530    DEBUG   index-cache.yaml loaded {"repo": ""}
2021-01-16T14:15:44.481+0530    DEBUG   Fetching chart list from storage        {"repo": ""}
2021-01-16T14:15:44.481+0530    DEBUG   No change detected between cache and storage    {"repo": ""}
2021-01-16T14:15:44.481+0530    INFO    Starting ChartMuseum    {"port": 8080}
```

Add local repo

 # helm repo add chartmuseum http://localhost:8080/

```
[root@master ~]# helm repo add chartmuseum http://localhost:8080/
"chartmuseum" has been added to your repositories
[root@master ~]#
[root@master ~]# helm repo list
NAME            URL
stable          https://charts.helm.sh/stable
chartmuseum     http://localhost:8080/
```

 # helm search repo chartmuseum/

```
[root@master ~]# helm search repo chartmuseum/
NAME                    CHART VERSION   APP VERSION     DESCRIPTION
chartmuseum/my-nginx    0.4.0           1               My custom nginx chart
```

Install Chart through local repo

 # helm install my-nginx-app chartmuseum/my-nginx

```
[root@master ~]# helm install my-nginx-app chartmuseum/my-nginx
NAME: my-nginx-app
LAST DEPLOYED: Sat Jan 16 14:19:57 2021
NAMESPACE: default
STATUS: deployed
REVISION: 1
```

 # kubectl get all

```
[root@master ~]# kubectl get all
NAME                            READY   STATUS              RESTARTS   AGE
pod/my-nginx-6b74b79f57-bnv6h   0/1     ContainerCreating   0          6s
pod/my-nginx-6b74b79f57-nrj5p   1/1     Running             0          6s

NAME                 TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)        AGE
service/kubernetes   ClusterIP   10.96.0.1      <none>        443/TCP        13d
service/my-nginx     NodePort    10.103.43.29   <none>        80:32412/TCP   6s

NAME                       READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-nginx   1/2     2            1           6s

NAME                                  DESIRED   CURRENT   READY   AGE
replicaset.apps/my-nginx-6b74b79f57   2         2         1       6s
```

Uninstall Chart

 # helm uninstall my-nginx-app
 # kubectl get all

```
[root@master ~]# helm uninstall my-nginx-app
release "my-nginx-app" uninstalled
[root@master ~]#
[root@master ~]#
[root@master ~]# kubectl get all
NAME                 TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.96.0.1    <none>        443/TCP   13d
```

Change Repo Name

Remove existing repo "chartmuseum"

 # helm repo list
 # helm repo remove chartmuseum

```
[root@master ~]# helm repo list
NAME            URL
stable          https://charts.helm.sh/stable
chartmuseum     http://localhost:8080/
[root@master ~]#
[root@master ~]# helm repo remove chartmuseum
"chartmuseum" has been removed from your repositories
```

Add repo with your custom repo name

 # helm repo add myrepo http://localhost:8080/

```
[root@master ~]# helm repo add myrepo http://localhost:8080/
"myrepo" has been added to your repositories
```

Verify repo list

 # helm repo list

```
[root@master ~]# helm repo list
NAME    URL
stable  https://charts.helm.sh/stable
myrepo  http://localhost:8080/
```

Search repo

 # helm search repo myrepo/

```
[root@master ~]# helm search repo myrepo/
NAME            CHART VERSION   APP VERSION     DESCRIPTION
myrepo/my-nginx 0.4.0           1               My custom nginx chart
```

Install chart with new repo name

 # helm install my-nginx-app myrepo/my-nginx

```
[root@master ~]# helm install my-nginx-app myrepo/my-nginx
NAME: my-nginx-app
LAST DEPLOYED: Sat Jan 16 14:31:00 2021
NAMESPACE: default
STATUS: deployed
REVISION: 1
TEST SUITE: None
```

How to release new version of package

- Index.yaml consists of list of charts.

Check number of charts we have

```
[root@master charts]# ls -tlrh
total 8.0K
-rw-r--r--. 1 root root 615 Jan 16 13:16 my-nginx-0.4.0.tgz
-rw-r--r--. 1 root root 396 Jan 16 13:55 index-cache.yaml
drwxr-xr-x. 3 root root  60 Jan 16 14:34 my-nginx
```

Change version of Chart

 # vi my-nginx/Chart.yaml

```
[root@master charts]# cat my-nginx/Chart.yaml
apiVersion: v1
name: my-nginx
version: 0.5.0
appVersion: 1.0
description: My custom nginx chart
```

Create package

 # helm package my-nginx

```
[root@master charts]# helm package my-nginx
Successfully packaged chart and saved it to: /root/charts/my-nginx-0.5.0.tgz
```

It will create new version of package

```
[root@master charts]# ls -tlrh
total 12K
-rw-r--r--. 1 root root 615 Jan 16 13:16 my-nginx-0.4.0.tgz
-rw-r--r--. 1 root root 396 Jan 16 13:55 index-cache.yaml
drwxr-xr-x. 3 root root  60 Jan 16 14:34 my-nginx
-rw-r--r--. 1 root root 616 Jan 16 14:36 my-nginx-0.5.0.tgz
```

But helm search shows previous version of chart

 # helm search repo myrepo/

```
[root@master charts]# helm search repo myrepo/
NAME            CHART VERSION   APP VERSION     DESCRIPTION
myrepo/my-nginx 0.4.0           1               My custom nginx chart
```

Repo update

 # helm repo update

```
[root@master charts]# helm repo update
Hang tight while we grab the latest from your chart repositories...
...Successfully got an update from the "myrepo" chart repository
...Successfully got an update from the "stable" chart repository
Update Complete. âHappy Helming!â
```

Now helm search shows new version

 # helm search repo myrepo/

```
[root@master charts]# helm search repo myrepo/
NAME            CHART VERSION   APP VERSION     DESCRIPTION
myrepo/my-nginx 0.5.0           1               My custom nginx chart
```

To list all the version

```
[root@master package]# helm search repo myrepo -l
NAME            CHART VERSION   APP VERSION     DESCRIPTION
myrepo/my-nginx 4.0.0           1               My custom nginx chart
myrepo/my-nginx 3.0.0           1               My custom nginx chart
[root@master package]#
```

Storages -https://chartmuseum.com/docs/#using-with-local-filesystem-storage