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## Objectives

Helm

Installation

Architecture

Charts

Functions

Pipelines

Conditionals

With Blocks

Range

Chart Hooks

Packaging &  
Signing

Uploading

What is Helm?



Service

Secret



PVC

PV

Deployment



```
apiVersion: v1
kind: Secret
metadata:
  name: wordpress-admin-password
data:
  key: Calksd1keBGmxcv23kjsdlkjr==
```

> \_

```
$ kubectl apply -f wp-secret.yaml
```

Secret

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: wordpress-mysql
labels:
```

> \_

```
$ kubectl apply -f wp-deploy.yaml
```

```
strategy:
  type: Recreate
template:
  metadata:
    labels:
      app: wordpress
      tier: mysql
  spec:
    containers:
      - image: mysql:5.6
```



```
apiVersion: v1
kind: Service
metadata:
  name: wordpress
labels:
  app: wordpress
spec:
  ports:
    - port: 80
  selector:
    app: wordpress
    tier: frontend
  type: LoadBalancer
```



> \_

```
$ kubectl apply -f wp-svc.yaml
```

Deployment



```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: wp-pv-claim
labels:
  app: wordpress
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 20Gi
```

PVC

> \_

```
$ kubectl apply -f wp-pvc.yaml
```

```
apiVersion: v1
kind: PersistentVolume
metadata:
  name: pv0003
spec:
  capacity:
    storage: 20Gi
  volumeMode: Filesystem
  accessModes:
    - ReadWriteOnce
```

> \_

```
$ kubectl apply -f wp-pv.yaml
```



Service

Secret



PVC

PV

Deployment





\_\_\_\_\_

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

INSTALL



> \_

```
$ helm install wordpress
```

```
$ helm upgrade wordpress
```

```
$ helm rollback wordpress
```

```
$ helm uninstall wordpress
```

values.yaml

```
wordpressUsername : user
```

```
## Application password
## Defaults to a random 10 -character alphanumeric string if not set
## ref: https://github.com/bitnami/bitnami -
##
# wordpressPassword :
```

```
## Admin email
## ref: https://github.com/bitnami/bitnami -
##
wordpressEmail : user@example.com
```

```
## First name
## ref: https://github.com/bitnami/bitnami -
##
wordpressFirstName : FirstName
```

```
## Last name
## ref: https://github.com/bitnami/bitnami -
##
wordpressLastName : LastName
```

```
## Blog name
## ref: https://github.com/bitnami/bitnami -
##
wordpressBlogName : Us .log
```

WordPress

Install & Configuration



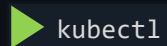
## Installing Helm

> \_

```
$ sudo snap install helm --classic
```

```
$ curl https://baltocdn.com/helm/signing.asc | sudo apt-key add -  
sudo apt-get install apt-transport-https --yes  
echo "deb https://baltocdn.com/helm/stable/debian/ all main" | sudo tee /etc/apt/sources.list.d/helm-stable-debian.li  
sudo apt-get update  
sudo apt-get install helm
```

```
$ pkg install helm
```

The Kubernetes logo, which is a green circle with a white ship's wheel (helm) inside, is positioned to the left of the text 'kubectl'.

kubectl



<https://helm.sh/docs/intro/install/>

## Labs

- Install helm on an existing kubernetes cluster
- Explore helm version
- Explore basic helm cli


Helm 2 vs 3



## Helm History



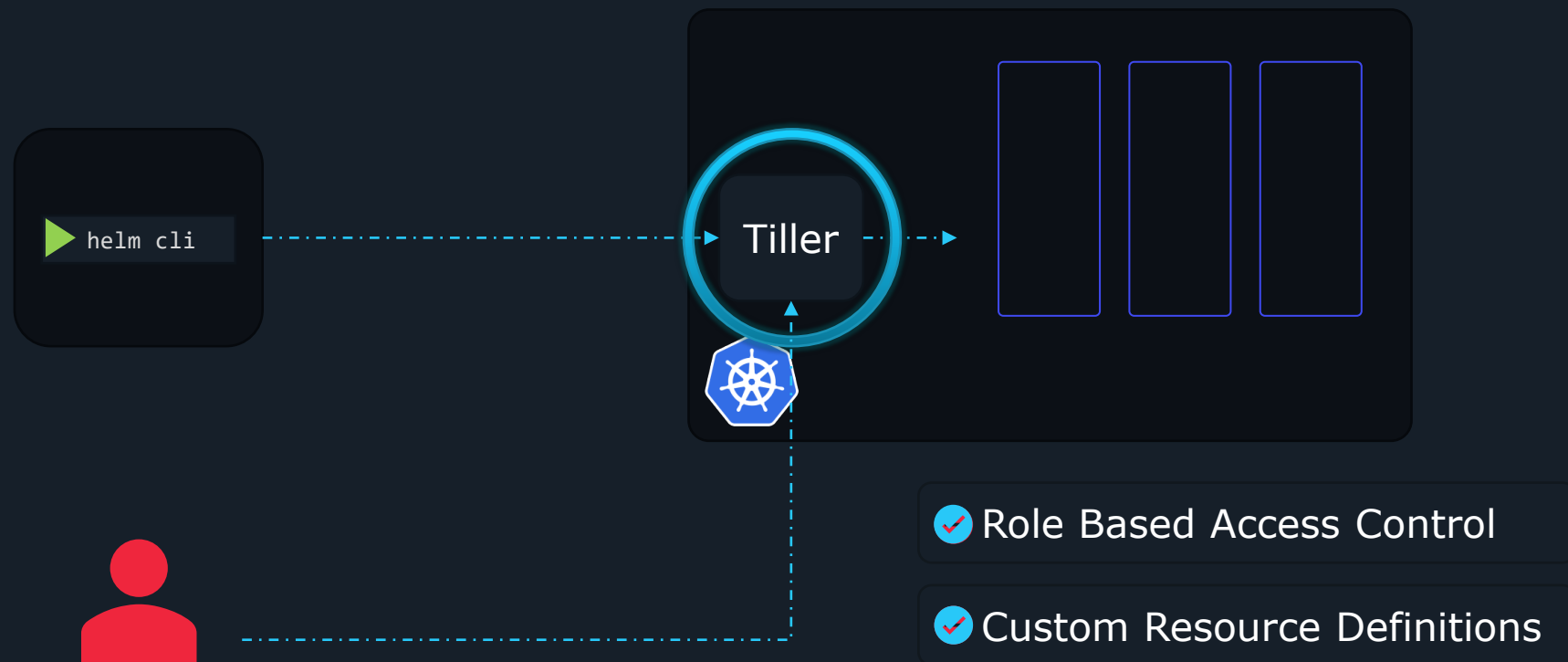
## Helm 2

 helm cli

— Role Based Access Control

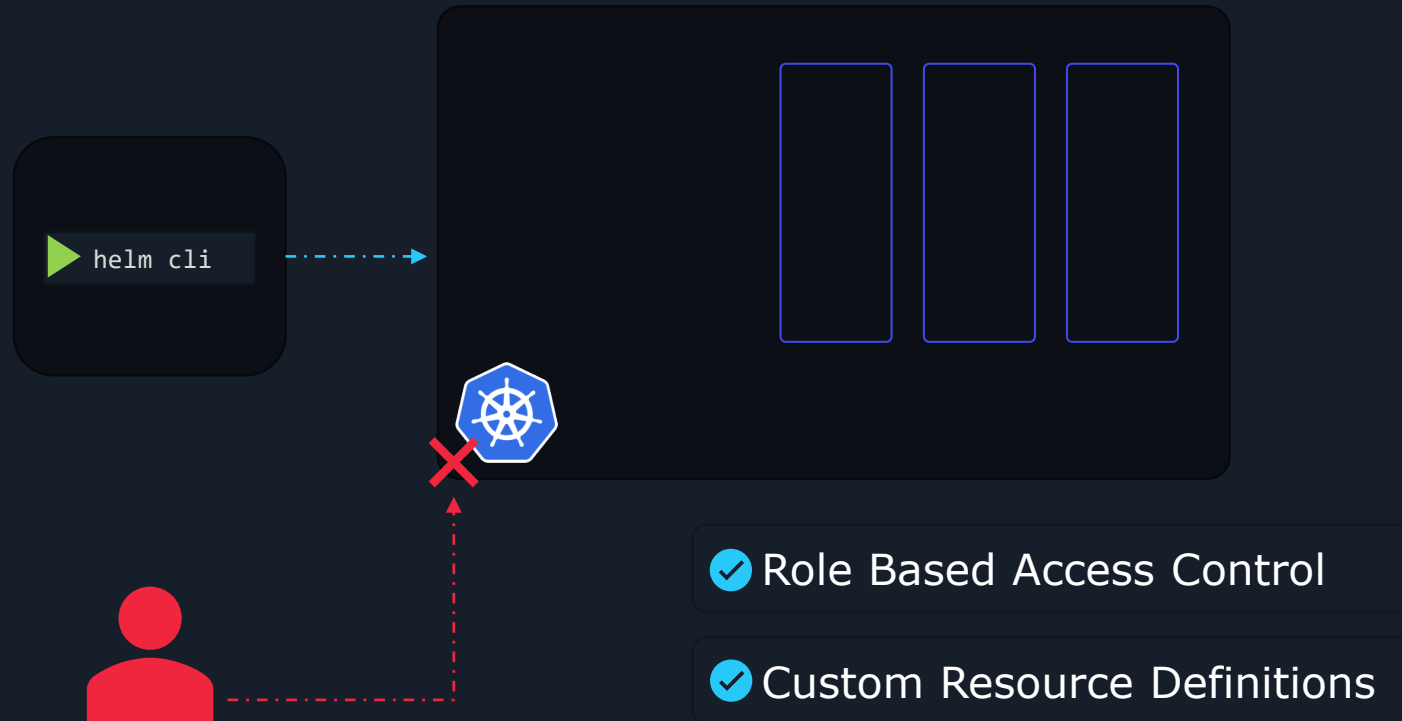
— Custom Resource Definitions

## Helm 2





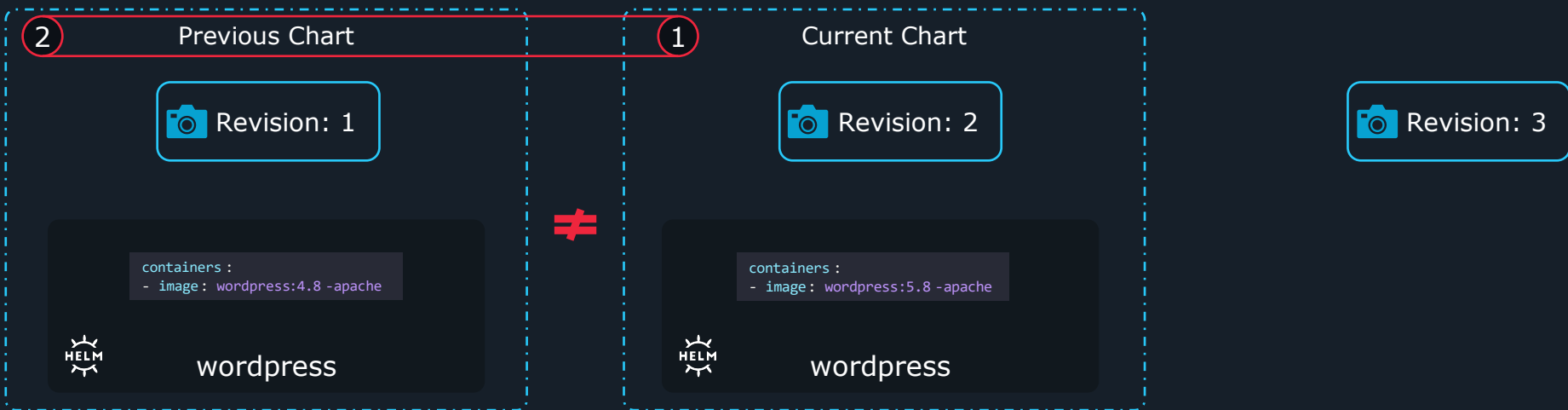
## Helm 3



Helm 2 vs Helm 3

	Helm 2	Helm 3
Tiller	✔	—
3-Way Strategic Merge Patch	—	✔

## Helm 2



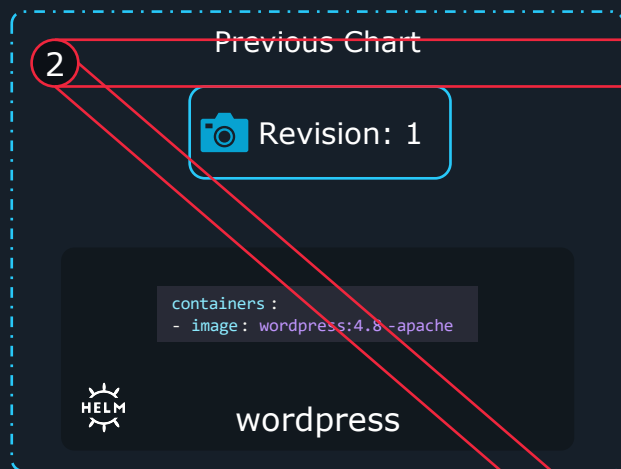
```
$ helm install wordpress
```

```
$ helm upgrade wordpress
```

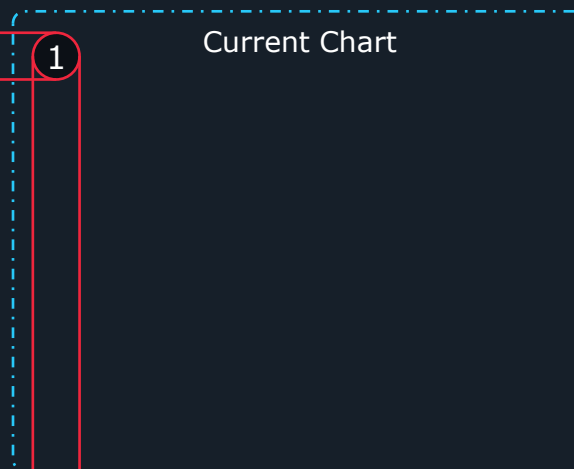
```
$ helm rollback wordpress
```



## Helm 2



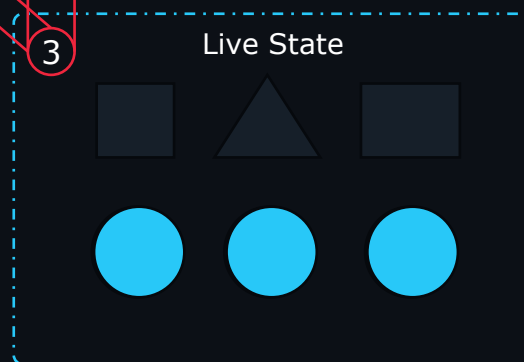
```
$ helm install wordpress
```



```
$ kubectl set image wordpress \
wordpress:5.8-apache
```

3-Way Strategic Merge Patch

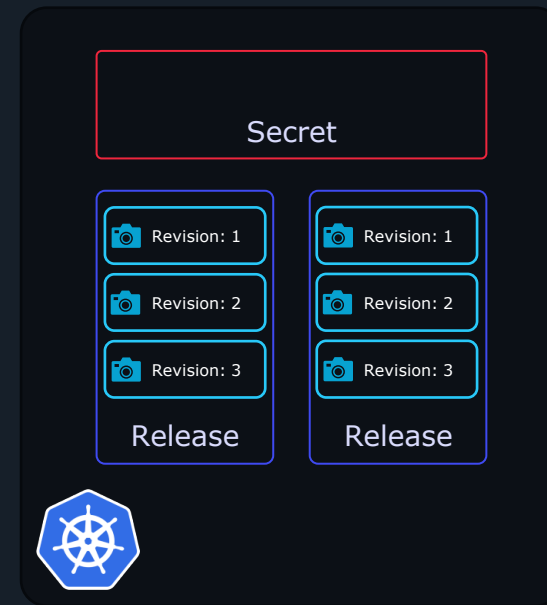
```
$ helm rollback wordpress
```



Helm Components



## Helm Components



## Helm Charts

```
service.yaml
apiVersion: v1
kind: Service
metadata:
  name: hello-world
spec:
  type: NodePort
  ports:
    - port: 80
      targetPort: http
      protocol: TCP
      name: http
  selector:
    app: hello-world
```

```
values.yaml
replicaCount: 1

image:
  repository: nginx
```

```
deployment.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: hello-world
spec:
  replicas: {{ .Values.replicaCount }}
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: nginx
          image: "{{ .Values.image.repository }}"
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```



hello-world

## Helm Charts



```
apiVersion: {{ include "common.capabilities.deployment.apiVersion" . }}      deployment.yaml
kind: Deployment
metadata:
  name: {{ include "common.names.fullname" . }}
  namespace: {{ .Release.Namespace | quote }}
  labels: {{- include "common.labels.standard" . | nindent 4 }}
    {{- if .Values.commonLabels }}
    {{- include "common.tplvalues.render" ( dict "value" .Values.commonLabels "context" $ ) }}
    {{- end }}
  {{- if .Values.commonAnnotations }}
  annotations: {{- include "common.tplvalues.render" ( dict "value" .Values.commonAnnotations..
spec:
  selector:
    matchLabels: {{- include "common.labels.matchLabels" . | nindent 6 }}
  {{- if .Values.updateStrategy }}
  strategy: {{- toYaml .Values.updateStrategy | nindent 4 }}
  {{- end }}
  {{- if not .Values.autoscaling.enabled }}
  replicas: {{ .Values.replicaCount }}
```



wordpress



## Helm Releases

> \_

```
# helm install [release-name][chart-name]
```

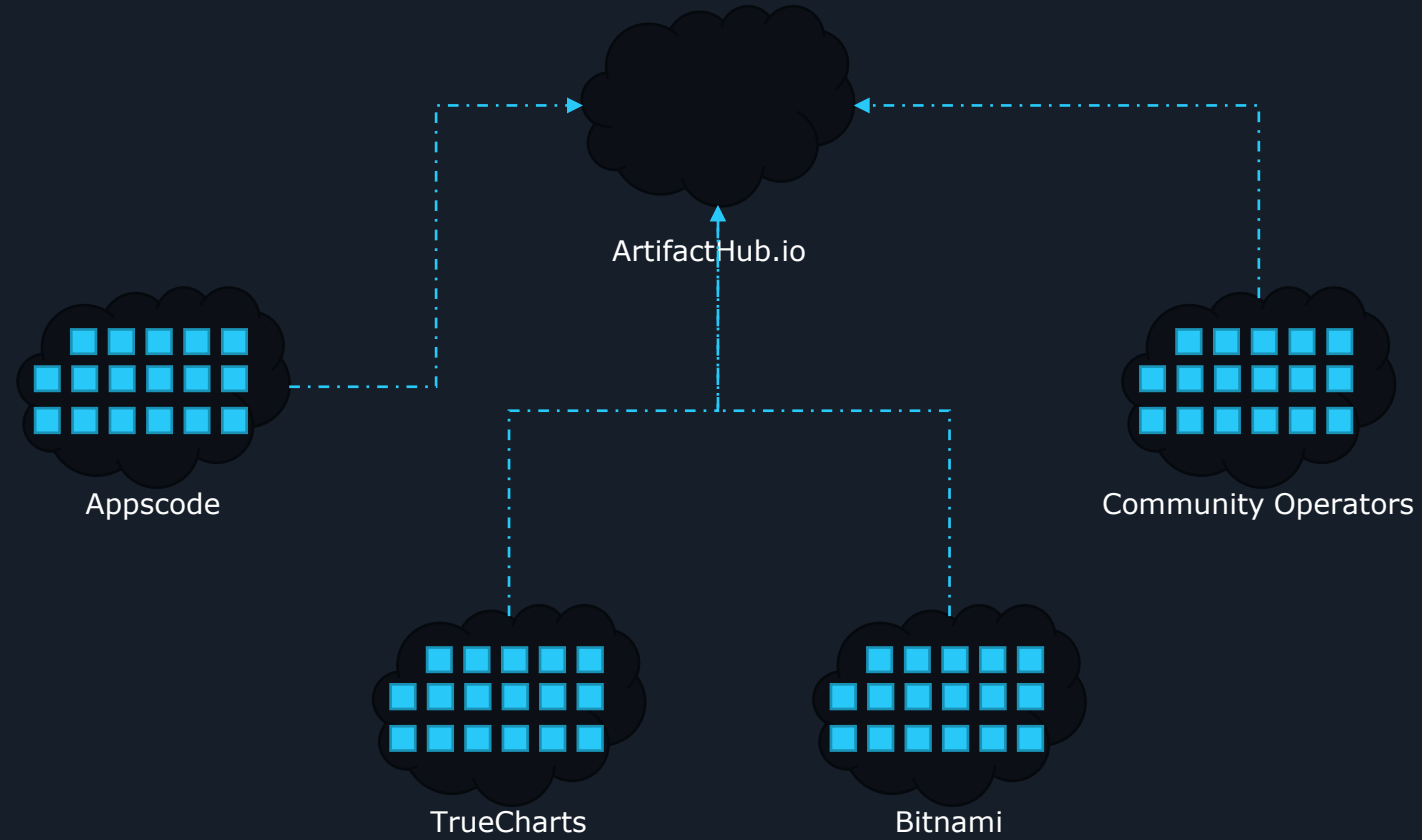
```
$ helm install my-site bitnami/wordpress
```

```
# helm install bitnami/wordpress
```

```
$ helm install my-SECOND-site bitnami/wordpress
```




## Helm Repositories






## Find, install and publish Kubernetes packages

 Search packages



 **Tip:** Use - to exclude words from your search. Example: **apache -solr -hadoop**

You can also **browse all packages** - or - try one of the sample queries:

Helm Charts in the storage category

Official Prometheus packages

Operators with auto pilot capabilities

Packages with Apache-2.0 license

Tekton tasks


6311


PACKAGES



100117

RELEASES

# Helm Repositories



STATS SIGN UP SIGN IN 

1 - 20 of 6176 results Show: 20  

FILTERS

☐ Official ⓘ

☐ Verified publishers ⓘ

KIND

☐ Helm charts (5582)

☐ OLM operators (213)

☐ Krew kubectl plugins (169)

☐ Tekton tasks (127)

☐ Helm plugins (30)


☐ Falco rules (23)

☐ Keptn integrations (13)

☐ Tinkerbell actions (11)

☐ OPA policies (5)

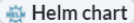
☐ Tekton pipelines (2)



kube-prometheus-stack


ORG: Prometheus REPO: prometheus-community


VERSION: 19.2.3 APP VERSION: 0.50.0


★ 194 


Updated 3 days ago

kube-prometheus-stack collects Kubernetes manifests, Grafana dashboards, and Prometheus rules combined with docum...

 Official

 Verified Publisher


 Images Security Rating



ingress-nginx


ORG: Kubernetes REPO: ingress-nginx


VERSION: 4.0.6 APP VERSION: 1.0.4

★ 162 

Updated a month ago

Ingress controller for Kubernetes using NGINX as a reverse proxy and load balancer

 In Production

 Images Security Rating

Helm Charts



# Helm Charts

```
apiVersion: v1    service.yaml
kind: Service
metadata:
  name: hello-world
spec:
  type: NodePort
  ports:
    - port: 80
      targetPort: http
      protocol: TCP
      name: http
  selector:
    app: hello-world
```

```
apiVersion: apps/v1    deployment.yaml
kind: Deployment
metadata:
  name: hello-world
spec:
  replicas: {{ .Values.replicaCount }}
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: "{{ .Values.image.repository }}"
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```

```
replicaCount: 1    values.yaml
image:
  repository: nginx
```

```
apiVersion: v2    Chart.yaml
appVersion: "1.16.0"
name: hello-world
description: A web application

type: application
```

Template



```
$ helm install hello-world
```

## Chart.yaml

```
apiVersion: v2
appVersion: 5.8.1
version: 12.1.27
name: wordpress
description: Web publishing platform for building blogs and websites.
type: application
dependencies:
  - condition: mariadb.enabled
    name: mariadb
    repository: https://charts.bitnami.com/bitnami
    version: 9.x.x
    <code hidden>
keywords:
  - application
  - blog
  - wordpress
maintainers:
  - email: containers@bitnami.com
    name: Bitnami
home: https://github.com/bitnami/charts/tree/master/bitnami/wordpress
icon: https://bitnami.com/assets/stacks/wordpress/img/wordpress-stack-220x234.png
```

Helm 2

v1

Helm 3

v2

Types

application

library

# A chart can be either an 'application' or a 'library' chart.

#

# Application charts are a collection of templates that can be packaged into versioned archives  
# to be deployed.







#

# Library charts provide useful utilities or functions for the chart developer. They're included as  
# a dependency of application charts to inject those utilities and functions into the rendering  
# pipeline. Library charts do not define any templates and therefore cannot be deployed



## Helm Chart Structure

### hello-world-chart

	templates	# Templates directory
	values.yaml	# Configurable values
	Chart.yaml	# Chart information
	LICENSE	# Chart License
	README.md	# Readme file
	charts	# Dependency Charts

☰ README.md

## WordPress

[WordPress](#) is one of the most versatile open source content management systems on the market. A publishing platform for building blogs and websites.

## TL;DR

```
$ helm repo add bitnami https://charts.bitnami.com/bitnami
$ helm install my-release bitnami/wordpress
```

## Introduction

This chart bootstraps a [WordPress](#) deployment on a [Kubernetes](#) cluster using the [Helm](#) package manager.

It also packages the [Bitnami MariaDB chart](#) which is required for bootstrapping a MariaDB deployment for the database requirements of the WordPress application, and the [Bitnami Memcached chart](#) that can be used to cache database queries.

Bitnami charts can be used with [Kubeapps](#) for deployment and management of Helm Charts in clusters. This chart has been tested to work with NGINX Ingress, cert-manager, Fluentd and Prometheus on top of the [BKPR](#).

## Prerequisites

- Kubernetes 1.12+
- Helm 3.1.0
- PV provisioner support in the underlying infrastructure

Working with Helm



## Helm CLI

> \_

**\$ helm --help**

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

Usage:

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

## Helm CLI

```
>_
```

```
$ helm repo --help
```

This command consists of multiple subcommands to interact with chart repositories.

It can be used to add, remove, list, and index chart repositories.

Usage:

```
helm repo [command]
```

Available Commands:

add	add a chart repository
index	generate an index file given a directory containing packaged charts
list	list chart repositories
remove	remove one or more chart repositories
update	update information of available charts locally from chart repositories

```
$ helm repo update --help
```

Update gets the latest information about charts from the respective chart repositories. Information is cached locally, where it is used by commands like 'helm search'.



Usage:




```
helm repo update [flags]
```



Aliases:

```
update, up
```


# Wordpress


 Search packages STATS SIGN UP SIGN IN 

 **wordpress** ☆ Star 16  

ORG: Bitnami REPO:  Helm chart Bitnami  Verified Publisher

Web publishing platform for building blogs and websites.

 SUBSCRIPTIONS: 2

 **WordPress**

WordPress is one of the most versatile open source content management systems on the market. A publishing platform for building blogs and websites.

TL;DR

```
$ helm repo add bitnami https://charts.bitnami.com/bitnami
$ helm install my-release bitnami/wordpress
```

**Introduction**

This chart bootstraps a WordPress deployment on a Kubernetes cluster using the Helm package manager.

It also packages the Bitnami MariaDB chart which is required for bootstrapping a MariaDB deployment for the database requirements of the WordPress application, and the Bitnami Memcached chart that can be used to cache database queries.

Bitnami charts can be used with Kubeapps for deployment and management of Helm Charts in clusters. This chart has been tested to work with NGINX Ingress, cert-manager, Fluentd and Prometheus on top of the BKPR.

**Prerequisites**

- Kubernetes 1.12+

↓ INSTALL


📄 TEMPLATES

📄 VALUES SCHEMA

📄 CHANGELOG

APPLICATION VERSION

5.7.2

CHART VERSIONS 


11.0.12 (28 May, 2021)

11.0.11 (26 May, 2021)

11.0.10 (26 May, 2021)

[See all](#)

SECURITY REPORT

511 vulnerabilities found 

CRITICAL	24
HIGH	76
MEDIUM	79
LOW	328
UNKNOWN	4

LAST SCAN: 4 hours ago

## Wordpress

> \_

\$ helm search wordpress

Search provides the ability to search for Helm charts in the various places they can be stored including the Artifact Hub and repositories you have added. Use search subcommands to search different locations for charts.

Usage:

helm search [command]

Available Commands:

hub            search for charts in the Artifact Hub or your own hub instance  
repo          search repositories for a keyword in charts

\$ helm search hub wordpress

URL	CHART VERSION	APP VERSION	DESCRIPTION
<a href="https://artifacthub.io/packages/helm/riftbit/wordpress">https://artifacthub.io/packages/helm/riftbit/wo...</a>	12.1.16	5.8.1	Web publishing platform for building blogs
<a href="https://artifacthub.io/packages/helm/bitnami-akamai/wordpress">https://artifacthub.io/packages/helm/bitnami-ak...</a>	12.1.18	5.8.1	Web publishing platform for building blogs
<a href="https://artifacthub.io/packages/helm/bitnami/wordpress">https://artifacthub.io/packages/helm/bitnami/wo...</a>	12.1.27	5.8.1	Web publishing platform for building blogs

## Deploying Wordpress

>\_

```
$ helm repo add bitnami https://charts.bitnami.com/bitnami
```

```
"bitnami" has been added to your repositories
```

```
$ helm install my-release bitnami/wordpress
```

```
NAME: my-release
LAST DEPLOYED: Wed Nov 10 18:03:50 2021
NAMESPACE: default
STATUS: deployed
REVISION: 1
TEST SUITE: None
NOTES:
CHART NAME: wordpress
CHART VERSION: 12.1.27
APP VERSION: 5.8.1
```

```
** Please be patient while the chart is being deployed **
```

```
Your WordPress site can be accessed through the following DNS name
from within your cluster:
```

```
my-release-wordpress.default.svc.cluster.local (port 80)
```

### WordPress

WordPress is one of the most versatile open source content management systems for building blogs and websites.

#### TL;DR

```
$ helm repo add bitnami https://charts.bitnami.com/bitnami
$ helm install my-release bitnami/wordpress
```

### USER'S BLOG!

Just another WordPress site

## Hello world!

Welcome to WordPress. This is your first post. Edit or delete it, then start writing!

Published May 30, 2021  
Categorized as [Uncategorized](#)

## Helm Releases

> \_

```
$ helm list
```

NAME	NAMESPACE	REVISION	UPDATED	STATUS	CHART	APP VERSION
my-release	default	1	2021-11-10 18:03:50.414174217 +0000 UTC	deployed	wordpress-12.1.27	5.8.1

```
$ helm uninstall my-release
```

```
release "my-release" uninstalled
```



## Helm Repo

> \_

\$ helm repo

This command consists of multiple subcommands to interact with chart repositories.

It can be used to add, remove, list, and index chart repositories.

Usage:

helm repo [command]

Available Commands:

add	add a chart repository
index	generate an index file given a directory containing packaged charts
list	list chart repositories
remove	remove one or more chart repositories
update	update information of available charts locally from chart repositories

\$ helm repo list

NAME	URL
bitnami	<a href="https://charts.bitnami.com/bitnami">https://charts.bitnami.com/bitnami</a>

\$ helm repo update

Hang tight while we grab the latest from your chart repositories...  
...Successfully got an update from the "bitnami" chart repository  
Update Complete. ✨Happy Helming!✨

Customizing Chart Parameters



> \_

```
$ helm install my-release bitnami/wordpress
```



## Hello world!

Welcome to WordPress. This is your first post. Edit or delete it, then start writing!

Published May 30, 2021  
Categorized as Uncategorized

## Helm Charts

```
image:                                values.yaml
  registry: docker.io
  repository: bitnami/wordpress
  tag: 5.8.2-debian-10-r0

## @param wordpressUsername WordPress username
##
wordpressUsername: user
## @param wordpressPassword WordPress user
password
## Defaults to a random 10-character alphanumeric
string if not set
##
wordpressPassword: ""
## @param existingSecret
##
existingSecret: ""
## @param wordpressEmail WordPress user email
##
wordpressEmail: user@example.com
## @param wordpressFirstName WordPress user first
name
##
## @param wordpressBlogName Blog name
##
wordpressBlogName: User's Blog!
```

```
apiVersion: {{ include "apiVersion" . }} deployment.yaml
kind: Deployment
metadata:
  name: {{ include "common.names.fullname" . }}
  namespace: {{ .Release.Namespace | quote }}
  labels: {{- include "common.labels.standard" . | nindent 4 }}
spec:
  selector:
    matchLabels: {{- include "common.labels.matchLabels" . | nindent 4 }}
  replicas: {{ .Values.replicaCount }}
  {{- end }}
  template:
    spec:
      containers:
        - name: wordpress
          image: {{ template "wordpress.image" . }}
      env:
        - name: WORDPRESS_DATABASE_NAME
          value: {{ include "wordpress.databaseName" . | quote }}
        - name: WORDPRESS_DATABASE_USER
          value: {{ include "wordpress.databaseUser" . | quote }}
        - name: WORDPRESS_USERNAME
          value: {{ .Values.wordpressUsername | quote }}
        - name: WORDPRESS_PASSWORD
          valueFrom:
            secretKeyRef:
              name: {{ include "wordpress.secretName" . }}
              key: wordpress-password
        - name: WORDPRESS_BLOG_NAME
          value: {{ .Values.wordpressBlogName | quote }}
```

USER'S BLOG!  
Just another WordPress site

# Hello world!

Welcome to WordPress. This is your first post. Edit or delete it,  
start writing!

Published May 30, 2021  
Categorized as [Uncategorized](#)



> \_

```
$ helm install my-release bitnami/wordpress
```

```
image:                                values.yaml
  registry: docker.io
  repository: bitnami/wordpress
  tag: 5.8.2-debian-10-r0


## @param wordpressUsername WordPress username
##
wordpressUsername: user
## @param wordpressPassword WordPress user
password
## Defaults to a random 10-character alphanumeric
string if not set
##
wordpressPassword: ""
## @param existingSecret
##
existingSecret: ""
## @param wordpressEmail WordPress user email
##
wordpressEmail: user@example.com
## @param wordpressFirstName WordPress user first
name
##
## @param wordpressBlogName Blog name
##
wordpressBlogName: User's Blog!
```

## Custom Parameters in Command Line

--set

> \_

```
$ helm install --set wordpressBlogName="Helm Tutorials" my-release bitnami/wordpress  
--set wordpressEmail="john@example.com"
```



```
image:                               values.yaml  
  registry: docker.io  
  repository: bitnami/wordpress  
  tag: 5.8.2-debian-10-r0  
  
## @param wordpressUsername WordPress username  
##  
wordpressUsername: user  
## @param wordpressPassword WordPress user  
password  
## Defaults to a random 10-character alphanumeric  
string if not set  
##  
wordpressPassword: ""  
## @param existingSecret  
##  
existingSecret: ""  
## @param wordpressEmail WordPress user email  
##  
wordpressEmail: user@example.com  
## @param wordpressFirstName WordPress user first  
name  
##  
## @param wordpressBlogName Blog name  
##  
wordpressBlogName: User's Blog!
```

## Custom Parameters from a YAML file `--values`

> \_

```
$ helm install --values custom-values.yaml my-release bitnami/wordpress
```

custom-values.yaml

```
wordpressBlogName: Helm Tutorials  
wordpressEmail: john@example.com
```

## Helm Pull

> \_

```
$ helm pull bitnami/wordpress
```

```
$ helm pull --untar bitnami/wordpress
```

```
$ ls
```

wordpress

```
$ ls wordpress
```

Mode	LastWriteTime	Length	Name
----	-----	-----	----
d-----	13-Nov-21 10:36 PM		ci
d-----	13-Nov-21 10:36 PM		templates
-a----	13-Nov-21 10:36 PM	354	.helmignore
-a----	13-Nov-21 10:36 PM	399	Chart.lock
-a----	13-Nov-21 10:36 PM	984	Chart.yaml
-a----	13-Nov-21 10:36 PM	51019	README.md
-a----	13-Nov-21 10:36 PM	5918	values.schema.json
-a----	13-Nov-21 10:36 PM	35737	values.yaml

```
$ helm install my-release ./wordpress
```

```
image:                                values.yaml
  registry: docker.io
  repository: bitnami/wordpress
  tag: 5.8.2-debian-10-r0

## @param wordpressUsername WordPress username
##
wordpressUsername: user
## @param wordpressPassword WordPress user
password
## Defaults to a random 10-character alphanumeric
string if not set
##
wordpressPassword: ""
## @param existingSecret
##
existingSecret: ""
## @param wordpressEmail WordPress user email
##
wordpressEmail: user@example.com
## @param wordpressFirstName WordPress user first
name
##
## @param wordpressBlogName Blog name
##
wordpressBlogName: User's Blog!
```



Lifecycle Management



## Helm Releases

> \_

```
$ helm install my-site bitnami/wordpress
```

```
$ helm install my-SECOND-site bitnami/wordpress
```



## Helm Upgrade

> \_

```
$ helm install nginx-release bitnami/nginx --version 7.1.0
```

```
$ kubectl get pods
```

NAME	READY	STATUS	RESTARTS	AGE
nginx-release-687cdd5c75-ztn2n	0/1	ContainerCreating	0	13s

```
$ kubectl describe pod nginx-release-687cdd5c75-ztn2n
```

Containers:

nginx:

Container ID: docker://81bb5ad6b5..  
Image: docker.io/bitnami/nginx:1.19.2-debian-10-r28  
Image ID: docker-pullable://bitnami/nginx@sha256:2fcaf026b8acb7a..  
Port: 8080/TCP  
Host Port: 0/TCP  
State: Running



## Helm Upgrade

> \_

```
$ helm upgrade nginx-release bitnami/nginx
```

Release "nginx-release" has been upgraded. Happy Helming!

NAME: nginx-release

LAST DEPLOYED: Mon Nov 15 19:25:55 2021

NAMESPACE: default

STATUS: deployed

REVISION: 2

TEST SUITE: None

NOTES:

CHART NAME: nginx

CHART VERSION: 9.5.13

APP VERSION: 1.21.4

```
$ kubectl get pods
```

NAME	READY	STATUS	RESTARTS	AGE
nginx-release-7b78f4fdcd-2zr7k	1/1	Running	0	2m50s

```
$ kubectl describe pod nginx-release-7b78f4fdcd-2zr7k
```

Containers:

nginx:

Container ID: docker://2a1920aa5409690d9813fe54a3b71...

Image: docker.io/bitnami/nginx:1.21.4-debian-10-r0

Image ID: docker-pullable://bitnami/nginx@sha256:49080e247d88fae19f...



## Helm Upgrade

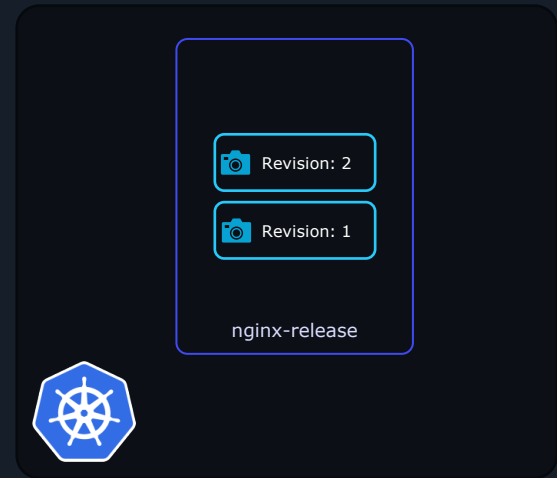
> \_

\$ helm list

NAME	NAMESPACE	REVISION	STATUS	CHART	APP VERSION
nginx-release	default	2	deployed	nginx-9.5.13	1.21.4

\$ helm history nginx-release

REVISION	UPDATED	STATUS	CHART	APP VERSION	DESCRIPTION
1	Mon Nov 15 19:20:51 2021	superseded	nginx-7.1.0	1.19.2	Install complete
2	Mon Nov 15 19:25:55 2021	deployed	nginx-9.5.13	1.21.4	Upgrade complete



## Helm Rollback

> \_

\$ helm list

NAME	NAMESPACE	REVISION	STATUS	CHART	APP VERSION
nginx-release	default	2	deployed	nginx-9.5.13	1.21.4

\$ helm history nginx-release

REVISION	UPDATED	STATUS	CHART	APP VERSION	DESCRIPTION
1	Mon Nov 15 19:20:51 2021	superseded	nginx-7.1.0	1.19.2	Install complete
2	Mon Nov 15 19:25:55 2021	deployed	nginx-9.5.13	1.21.4	Upgrade complete

\$ helm rollback nginx-release 1

Rollback was a success! Happy Helming!

\$ helm history nginx-release

REVISION	UPDATED	STATUS	CHART	APP VERSION	DESCRIPTION
1	Mon Nov 15 19:20:51 2021	superseded	nginx-7.1.0	1.19.2	Install complete
2	Mon Nov 15 19:25:55 2021	superseded	nginx-9.5.13	1.21.4	Upgrade complete
3	Mon Nov 15 20:24:27 2021	deployed	nginx-7.1.0	1.19.2	Rollback to 1



## Helm Upgrade

>\_

```
$ helm upgrade wordpress-release bitnami/wordpress
```

```
Error: UPGRADE FAILED: template: wordpress/templates/NOTES.txt:83:4: executing "wordpress/templates/NOTES.txt" at <include "common.errors.upgrade.passwords.empty" (dict "validationErrors" $passwordValidationErrors "context" $)>: error calling include: template: wordpress/charts/common/templates/_errors.tpl:21:48: executing "common.errors.upgrade.passwords.empty" at <fail>: error calling fail:
PASSWORDS ERROR: You must provide your current passwords when upgrading the release.
                    Note that even after reinstallation, old credentials may be needed as they may be kept in persistent volume claims.
                    Further information can be obtained at https://docs.bitnami.com/general/how-to/troubleshoot-helm-chart-issues/#credential-errors-while-upgrading-chart-releases

'wordpressPassword' must not be empty, please add '--set wordpressPassword=$WORDPRESS_PASSWORD' to the command. To get the current value:

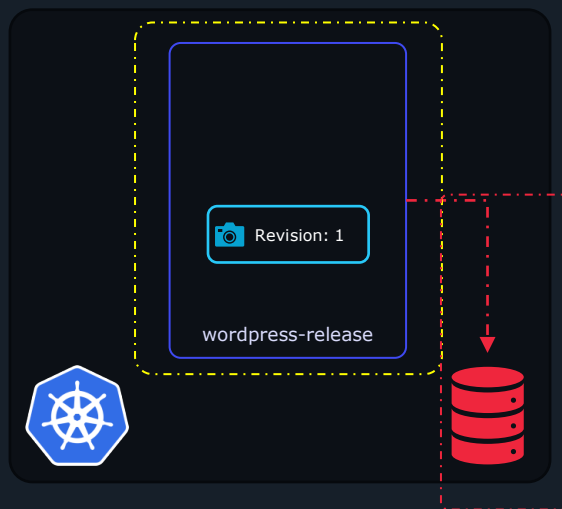
    export WORDPRESS_PASSWORD=$(kubectl get secret --namespace "default" wordpress-release -o jsonpath="{.data.wordpress-password}" | base64 --decode)

'mariadb.auth.rootPassword' must not be empty, please add '--set mariadb.auth.rootPassword=$MARIADB_ROOT_PASSWORD' to the command. To get the current value:

    export MARIADB_ROOT_PASSWORD=$(kubectl get secret --namespace "default" wordpress-release-mariadb -o jsonpath="{.data.mariadb-root-password}" | base64 --decode)

'mariadb.auth.password' must not be empty, please add '--set mariadb.auth.password=$MARIADB_PASSWORD' to the command. To get the current value:

    export MARIADB_PASSWORD=$(kubectl get secret --namespace "default" wordpress-release-mariadb -o jsonpath="{.data.mariadb-password}" | base64 --decode)
```





# Understanding Helm Charts



Writing  
Charts

Templating

Functions

Chart Hooks

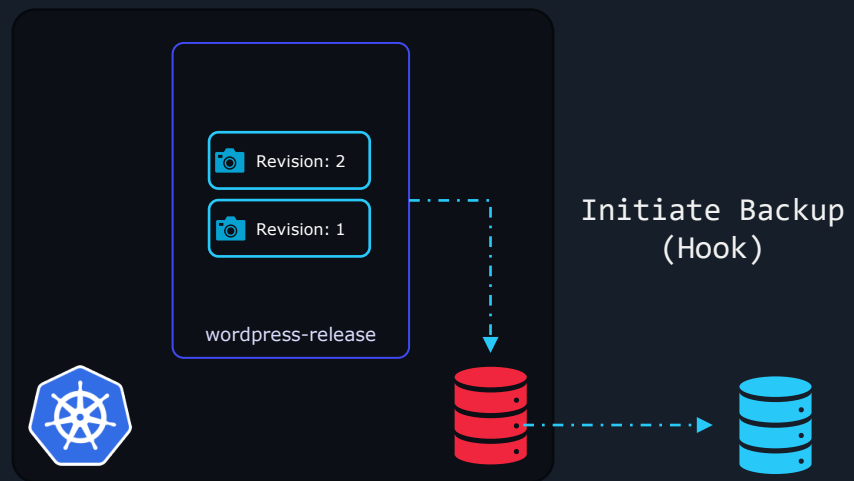
Chart Tests

Provenance

## Writing a Helm Charts



```
$ helm upgrade wordpress-release bitnami/wordpress
```



## Writing Our First Helm Chart

 hello-world-chart

 templates

 values.yaml

 Chart.yaml

 LICENSE

 README.md

```
$ helm create nginx-chart
```

```
$ ls nginx-chart  
charts  Chart.yaml  templates  values.yaml
```

```
apiVersion: v1      service.yaml  
kind: Service  
metadata:  
  name: hello-world  
spec:  
  type: NodePort  
  ports:  
    - port: 80  
      targetPort: http  
      protocol: TCP  
      name: http  
  selector:  
    app: hello-world
```

```
apiVersion: apps/v1      deployment.yaml  
kind: Deployment  
metadata:  
  name: hello-world  
spec:  
  replicas: 2  
  selector:  
    matchLabels:  
      app: hello-world  
  template:  
    metadata:  
      labels:  
        app: hello-world  
    spec:  
      containers:  
        - name: hello-world  
          image: nginx  
          ports:  
            - name: http  
              containerPort: 80  
              protocol: TCP
```

> \_

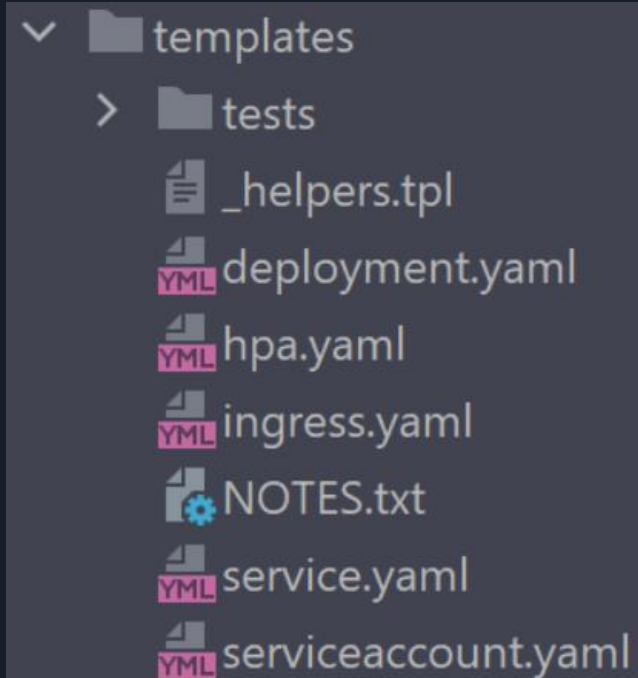
```
$ cd nginx-chart
```

```
$ vi Chart.yaml
```

```
$ ls templates
```

```
deployment.yaml _helpers.tpl hpa.yaml ingress.yaml  
NOTES.txt serviceaccount.yaml service.yaml tests
```

```
$ rm -r templates/*
```



> \_

```
$ helm install hello-world-1 ./nginx-chart
```

```
$ kubectl get deployment
```

NAME	READY	UP-TO-DATE	AVAILABLE	AGE
hello-world	0/2	2	0	24s

```
$ helm install hello-world-2 ./nginx-chart
```

Error: rendered manifests contain a resource that already exists. Unable to continue with install: Deployment "hello-world" in namespace "default" exists and cannot be imported into the current release: invalid ownership metadata; annotation validation error: key "meta.helm.sh/release-name" must equal "hello-world-2": current value is "hello-world-1"

templates

```
apiVersion: v1      service.yaml
kind: Service
metadata:
  name: hello-world
spec:
  type: NodePort
  ports:
    - port: 80
      targetPort: http
      protocol: TCP
      name: http
  selector:
    app: hello-world
```

```
apiVersion: apps/v1      deployment.yaml
kind: Deployment
metadata:
  name: hello-world
spec:
  replicas: 2
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: nginx
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```



hello-world

hello-world-1

hello-world-2

## Templatize

> \_

```
$ helm install hello-world-1 ./nginx-chart
```

templates

```
apiVersion: v1      service.yaml
kind: Service
metadata:
  name: hello-world
spec:
  type: NodePort
  ports:
    - port: 80
      targetPort: http
      protocol: TCP
      name: http
  selector:
    app: hello-world
```

```
apiVersion: apps/v1      deployment.yaml
kind: Deployment
metadata:
  name: {{ .Release.Name }}-nginx
spec:
  replicas: 2
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: nginx
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```



hello-world-1-nginx

hello-world-1



Templatize

hello-world-1

{{ .Release.Name }}-nginx



Template Directive

Go Template Language

Templatize

```
hello-world-1-nginx
```

## Objects

Release.Name	Chart.Name	Capabilities.KubeVersion	
Release.Namespace	Chart.ApiVersion	Capabilities.ApiVersions	
Release.IsUpgrade	Chart.Version	Capabilities.HelmVersion	Values.replicaCount
Release.IsInstall	Chart.Type	Capabilities.GitCommit	Values.image
Release.Revision	Chart.Keywords	Capabilities.GitTreeState	
Release.Service	Chart.Home	Capabilities.GoVersion	

```
apiVersion: v2
appVersion: 5.8.1
version: 12.1.27
name: wordpress
description: Web publishing platform for building blogs and websites.
type: application
dependencies:
  - condition: mariadb.enabled
    name: mariadb
    repository: https://charts.bitnami.com/bitnami
    version: 9.x.x
    scope: hidden
```

Chart.yaml

```
# Default values for nginx-chart.
# This is a YAML-formatted file.
# Declare variables to be passed into your templates.

replicaCount: 2
image: nginx
```

values.yaml

## Templatize

> \_

```
$ helm install hello-world-1 ./nginx-chart
```

```
$ helm install hello-world-2 ./nginx-chart
```

```
$ kubectl get deployment
```

NAME	READY	UP-TO-DATE	AVAILABLE	AGE
hello-world-1-nginx	1/2	2	1	8s
hello-world-2-nginx	0/2	2	0	4s

### templates

```
apiVersion: v1      service.yaml
kind: Service
metadata:
  name: {{ .Release.Name }}-svc
spec:
  type: NodePort
  ports:
    - port: 80
      targetPort: http
      protocol: TCP
      name: http
  selector:
    app: hello-world
```

```
apiVersion: apps/v1      deployment.yaml
kind: Deployment
metadata:
  name: {{ .Release.Name }}-nginx
spec:
  replicas: 2
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: nginx
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```



hello-world-1-nginx

hello-world-1

hello-world-2-nginx

hello-world-2

## Templatize

> \_

```
$ helm install hello-world-1 ./nginx-chart  
--set replicaCount=2  
--set image=nginx
```

### templates

```
apiVersion: v1      service.yaml  
kind: Service  
metadata:  
  name: {{ .Release.Name }}-svc  
spec:  
  type: NodePort  
  ports:  
    - port: 80  
      targetPort: http  
      protocol: TCP  
      name: http  
  selector:  
    app: hello-world
```

```
apiVersion: apps/v1      deployment.yaml  
kind: Deployment  
metadata:  
  name: {{ .Release.Name }}-nginx  
spec:  
  replicas: {{ .Values.replicaCount }}  
  selector:  
    matchLabels:  
      app: hello-world  
  template:  
    metadata:  
      labels:  
        app: hello-world  
    spec:  
      containers:  
        - name: hello-world  
          image: {{ .Values.image }}  
          ports:  
            - name: http  
              containerPort: 80  
              protocol: TCP
```

```
# Default values for nginx-chart.      values.yaml  
# This is a YAML-formatted file.  
# Declare variables to be passed into your templates.  
  
replicaCount: 2  
image: nginx
```

## Templatize

```
# Default values for nginx-chart.
# This is a YAML-formatted file.
# Declare variables to be passed into your templates.

replicaCount: 2
image:
  repository: nginx
  pullPolicy: IfNotPresent
  tag: "1.16.0"
```

values.yaml

### templates

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: {{ .Release.Name }}-nginx
spec:
  replicas: {{ .Values.replicaCount }}
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: {{ .Values.image.repository }}:{{ .Values.image.tag }}
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```

## Templatize

```
image:  
  repository: nginx  
  pullPolicy: IfNotPresent  
  tag: "1.16.0"
```

```
nginx : 1.16.0
```

## Templatize

```
image:  
  repository: nginx  
  pullPolicy: IfNotPresent  
  tag: "1.16.0"
```

nginx:1.16.0



## Templatize

```
apiVersion: apps/v1      templates/deployment.yaml
kind: Deployment
metadata:
  name: {{ .Release.Name }}-nginx
spec:
  replicas: {{ .Values.replicaCount }}
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: {{ .Values.image.repository }}
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```

Release Details



```
values.yaml
replicaCount: 2

image:
  repository: nginx
  pullPolicy: IfNotPresent
  tag: "1.16.0"
```



Chart Details

```
apiVersion: apps/v1      deployment.yaml
kind: Deployment
metadata:
  name: hello-world
spec:
  replicas: 2
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: nginx
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```

Making Sure Chart is Working as  
Intended



## Verifying Helm Charts

Lint

Template

Dry Run

## Lint

> \_

```
$ helm lint ./nginx-chart
```

```
==> Linting ./nginx-chart/
[INFO] Chart.yaml: icon is recommended
[ERROR] templates/: template: nginx-
chart/templates/deployment.yaml:4:19: executing "nginx-
chart/templates/deployment.yaml" at <.Release.Name>: nil
pointer evaluating interface {}.Name
```

```
[ERROR] templates/deployment.yaml: unable to parse YAML:
error converting YAML to JSON: yaml: line 20: did not
find expected '-' indicator
```

```
Error: 1 chart(s) linted, 1 chart(s) failed
```

```
$ helm lint ./nginx-chart
```

```
==> Linting ./nginx-chart/
[INFO] Chart.yaml: icon is recommended
```

```
1 chart(s) linted, 0 chart(s) failed
```

templates

```
apiVersion: v1      service.yaml
kind: Service
metadata:
  name: {{ .Release.Name }}-svc
spec:
  type: NodePort
  ports:
    - port: 80
      targetPort: http
      protocol: TCP
      name: http
  selector:
    app: hello-world
```

```
apiVersion: apps/v1      deployment.yaml
kind: Deployment
metadata:
  name: {{ .Release.Name }}-nginx
spec:
  replicas: {{ .Values.replicaCount }}
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: {{ .Values.image }}
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```

```
# Default values for nginx-chart.      values.yaml
# This is a YAML-formatted file.
# Declare variables to be passed into your templates.

replicaCount: 2
image: nginx
```

## Validating Template

> \_

```
$ helm template hello-world-1 ./nginx-chart
```

```
---
# Source: nginx-chart/templates/deployment.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: hello-world-1-nginx
spec:
  replicas: 2
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: nginx
          ports:
            - name: http
              containerPort: 80
---
# Source: nginx-chart/templates/service.yaml
apiVersion: v1
kind: Service
metadata:
  name: hello-world-1-nginx
spec:
  type: NodePort
  ports:
    - port: 80
      targetPort: http
      protocol: TCP
      name: http
  selector:
```

templates

```
apiVersion: v1      service.yaml
kind: Service
metadata:
  name: {{ .Release.Name }}-svc
spec:
  type: NodePort
  ports:
    - port: 80
      targetPort: http
      protocol: TCP
      name: http
  selector:
    app: hello-world
```

```
apiVersion: apps/v1      deployment.yaml
kind: Deployment
metadata:
  name: {{ .Release.Name }}-nginx
spec:
  replicas: {{ .Values.replicaCount }}
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: {{ .Values.image }}
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```

```
# Default values for nginx-chart.      values.yaml
# This is a YAML-formatted file.
# Declare variables to be passed into your templates.

replicaCount: 2
image: nginx
```

## Validating Template

```
> _
```

```
$ helm template ./nginx-chart
```

```
Error: YAML parse error on nginx-chart/templates/deployment.yaml:
error converting YAML to JSON: yaml: line 5: mapping values are not
allowed in this context
```

```
$ helm template ./nginx-chart --debug
```

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: hello-world
spec:
  replicas: 2
  selector:
    matchLabels:
      app: hello-world
  template:
```

```
Error: YAML parse error on nginx-chart/templates/deployment.yaml:
error converting YAML to JSON: yaml: line 5: mapping values are not
allowed in this context
```

templates

```
apiVersion: v1      service.yaml
kind: Service
metadata:
  name: {{ .Release.Name }}-svc
spec:
  type: NodePort
  ports:
    - port: 80
      targetPort: http
      protocol: TCP
      name: http
  selector:
    app: hello-world
```

```
apiVersion: apps/v1      deployment.yaml
kind: Deployment
metadata:
  name: {{ .Release.Name }}-nginx
spec:
  replicas: {{ .Values.replicaCount }}
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: {{ .Values.image }}
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```

```
# Default values for nginx-chart.      values.yaml
# This is a YAML-formatted file.
# Declare variables to be passed into your templates.

replicaCount: 2
image: nginx
```

## Dry Run

> \_

```
$ helm install hello-world-1 ./nginx-chart --dry-run
```

```
Error: unable to build kubernetes objects from release manifest: error validating "": error validating data: [ValidationError(Deployment.spec.template.spec): unknown field "container" in io.k8s.api.core.v1.PodSpec, ValidationError(Deployment.spec.template.spec): missing required field "containers" in io.k8s.api.core.v1.PodSpec]
```

```
$ helm install hello-world-1 ./nginx-chart --dry-run
```

```
NAME: hello-world-1
LAST DEPLOYED: Fri Nov 19 18:34:51 2021
NAMESPACE: default
STATUS: pending-install
REVISION: 1
TEST SUITE: None
HOOKS:
MANIFEST:
---
# Source: nginx-chart/templates/service.yaml
apiVersion: v1
kind: Service
metadata:
  name: hello-world-1-nginx
spec:
  type: NodePort
  ports:
    - port: 80
```

### templates

```
apiVersion: v1      service.yaml
kind: Service
metadata:
  name: {{ .Release.Name }}-svc
spec:
  type: NodePort
  ports:
    - port: 80
      targetPort: http
      protocol: TCP
      name: http
  selector:
    app: hello-world
```

```
apiVersion: apps/v1      deployment.yaml
kind: Deployment
metadata:
  name: {{ .Release.Name }}-nginx
spec:
  replicas: {{ .Values.replicaCount }}
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      container:
        - name: hello-world
          image: {{ .Values.image }}
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```

```
# Default values for nginx-chart.      values.yaml
# This is a YAML-formatted file.
# Declare variables to be passed into your templates.

replicaCount: 2
image: nginx
```

Functions





```

apiVersion: apps/v1      templates/deployment.yaml
kind: Deployment
metadata:
  name: {{ .Release.Name }}-nginx
spec:
  replicas: {{ .Values.replicaCount }}
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: {{ .Values.image.repository }}
          ports:
            - name: http
              containerPort: 80
              protocol: TCP

```



```

                                values.yaml
replicaCount: 2

image:
  repository: 
  pullPolicy: IfNotPresent
  tag: "1.16.0"

```



```

apiVersion: apps/v1      deployment.yaml
kind: Deployment
metadata:
  name: hello-world
spec:
  replicas: 2
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: 
          ports:
            - name: http
              containerPort: 80
              protocol: TCP

```

```
$ kubectl get pods
```

NAME	READY	STATUS	RESTARTS	AGE
nginx-deployment-6c76ffbdd7-z4qgf	0/1	InvalidImageName	0	3s

## Functions

```
upper("helm")
```



```
"HELM"
```

```
trim(" helm ")
```



```
"helm"
```

## Templatize

```
apiVersion: apps/v1      templates/deployment.yaml
kind: Deployment
metadata:
  name: {{ .Release.Name }}-nginx
spec:
  replicas: {{ .Values.replicaCount }}
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
      - name: hello-world
        image: {{ .Values.image.repository }}
        ports:
        - name: http
          containerPort: 80
          protocol: TCP
```

Release Details



```
values.yaml
replicaCount: 2

image:
  repository: nginx
  pullPolicy: IfNotPresent
  tag: "1.16.0"
```



Chart Details

```
apiVersion: apps/v1      deployment.yaml
kind: Deployment
metadata:
  name: hello-world
spec:
  replicas: 2
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
      - name: hello-world
        image: nginx
        ports:
        - name: http
          containerPort: 80
          protocol: TCP
```

```
{{ .Values.image.repository }}
```



```
image: nginx
```

## String Functions

```
{{ upper .Values.image.repository }}
```



```
image: NGINX
```

```
{{ quote .Values.image.repository }}
```



```
image: "nginx"
```

```
{{ replace "x" "y".Values.image.repository }}
```



```
image: "nginy"
```

```
{{ shuffle .Values.image.repository }}
```



```
image: "xignn"
```

abbrev, abbrevboth, camelcase, cat, contains, hasPrefix, hasSuffix, indent, initials, kebabcase, lower, nindent, nospace, plural, print, printf, println, quote, randAlpha, randAlphaNum, randAscii, randNumeric, repeat, replace, shuffle, snakecase, squote, substr, swapcase, title, trim, trimAll, trimPrefix, trimSuffix, trunc, untitle, upper, wrap, wrapWith.

## Function List

Cryptographic  
and Security

Date

Dictionaries

Encoding

File Path

Kubernetes

Chart

Logic and Flow

Lists

Math

Network

Reflection

Regex

String

Type  
Conversion

URL

```

apiVersion: apps/v1                                     templates/deployment.yaml
kind: Deployment
metadata:
  name: {{ .Release.Name }}-nginx
spec:
  replicas: {{ .Values.replicaCount }}
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: {{ .Values.image.repository }}
          ports:
            - name: http
              containerPort: 80
              protocol: TCP

```



```

values.yaml
replicaCount: 2

image:
  repository:
  pullPolicy: IfNotPresent
  tag: "1.16.0"

```



```

apiVersion: apps/v1 deployment.yaml
kind: Deployment
metadata:
  name: hello-world
spec:
  replicas: 2
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image:
          ports:
            - name: http
              containerPort: 80
              protocol: TCP

```

```

apiVersion: apps/v1                                templates/deployment.yaml
kind: Deployment
metadata:
  name: {{ .Release.Name }}-nginx
spec:
  replicas: {{ .Values.replicaCount }}
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image: {{ default "nginx" .Values.image.repository }}
          ports:
            - name: http
              containerPort: 80
              protocol: TCP

```



```

values.yaml
replicaCount: 2

image:
  repository:
  pullPolicy: IfNotPresent
  tag: "1.16.0"

```



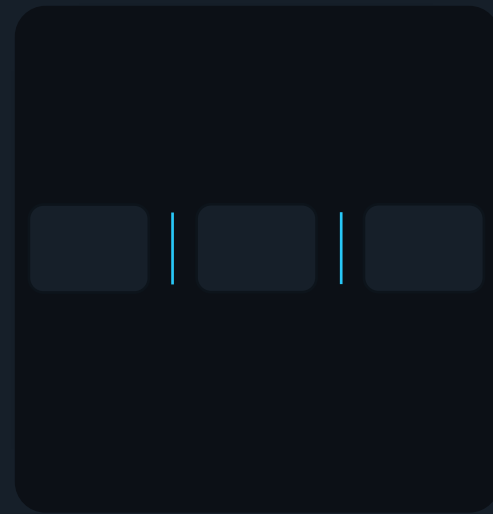
```

apiVersion: apps/v1 deployment.yaml
kind: Deployment
metadata:
  name: hello-world
spec:
  replicas: 2
  selector:
    matchLabels:
      app: hello-world
  template:
    metadata:
      labels:
        app: hello-world
    spec:
      containers:
        - name: hello-world
          image:
          ports:
            - name: http
              containerPort: 80
              protocol: TCP

```



Pipelines



## Pipelines

> \_

```
$ echo "abcd"
```

abcd

```
$ echo "abcd" | tr a-z A-Z
```

ABCD

## String Functions

```
{{ upper .Values.image.repository }}
```



```
image: NGINX
```

## String Functions

```
{{ .Values.image.repository | upper }}
```



```
image: NGINX
```

## String Functions

```
{{ .Values.image.repository | upper | quote }}
```



```
image: "NGINX"
```

## String Functions

```
{{ .Values.image.repository | upper | quote | shuffle }}
```



```
image: GN"XNI"
```

Conditionals



values.yaml

```
replicaCount: 2
image: nginx
orgLabel: payroll
```

service.yaml

```
apiVersion: v1
kind: Service
metadata:
  name: {{ .Release.Name }}-nginx
  labels:
    org: {{ .Values.orgLabel }}
spec:
  ports:
    - port: 80
      name: http
  selector:
    app: hello-world
```



## Conditionals

```
orgLabel = "payroll"  
print(orgLabel)
```

## Conditionals

```
orgLabel = "payroll"  
  
if orgLabel:  
    print(orgLabel)  
end
```

## Conditionals

values.yaml

```
replicaCount: 2  
image: nginx  
orgLabel: payroll
```

service.yaml

```
apiVersion: v1  
kind: Service  
metadata:  
  name: {{ .Release.Name }}-nginx  
  labels:  
    org: {{ .Values.orgLabel }}  
spec:  
  ports:  
    - port: 80  
      name: http  
  selector:  
    app: hello-world
```

## Conditionals

values.yaml

```
replicaCount: 2  
image: nginx  
orgLabel: payroll
```

service.yaml

```
apiVersion: v1  
kind: Service  
metadata:  
  name: {{ .Release.Name }}-nginx  
  {{ if .Values.orgLabel }}  
  labels:  
    org: {{ .Values.orgLabel }}  
  {{ end }}  
spec:  
  ports:  
    - port: 80  
      name: http  
  selector:  
    app: hello-world
```

## Conditionals

values.yaml

```
replicaCount: 2  
image: nginx
```

service.yaml

```
apiVersion: v1  
kind: Service  
metadata:  
  name: {{ .Release.Name }}-nginx  
  {{ if .Values.orgLabel }}  
  labels:  
    org: {{ .Values.orgLabel }}  
  {{ end }}  
spec:  
  ports:  
    - port: 80  
      name: http  
  selector:  
    app: hello-world
```

service.yaml

```
apiVersion: v1  
kind: Service  
metadata:  
  name: RELEASE-NAME-nginx  
  
spec:  
  ports:  
    - port: 80  
      name: http  
  selector:  
    app: hello-world
```

## Conditionals

```
apiVersion: v1                                service.yaml
kind: Service
metadata:
  name: {{ .Release.Name }}-nginx
  {{- if .Values.orgLabel }}
  labels:
    org: {{ .Values.orgLabel }}
  {{- end }}
spec:
  ports:
    - port: 80
      name: http
  selector:
    app: hello-world
```

```
apiVersion: v1                                service.yaml
kind: Service
metadata:
  name: RELEASE-NAME-nginx
  {{- if .Values.orgLabel }}
  labels:
    org: payroll
  {{- end }}
spec:
  ports:
    - port: 80
      name: http
  selector:
    app: hello-world
```

## Conditionals

```
apiVersion: v1                                service.yaml
kind: Service
metadata:
  name: {{ .Release.Name }}-nginx
  {{- if .Values.orgLabel }}
  labels:
    org: {{ .Values.orgLabel }}
  {{- end }}
spec:
  ports:
    - port: 80
      name: http
  selector:
    app: hello-world
```

```
apiVersion: v1                                service.yaml
kind: Service
metadata:
  name: RELEASE-NAME-nginx
  labels:
    org: payroll
spec:
  ports:
    - port: 80
      name: http
  selector:
    app: hello-world
```

## Conditionals

```
orgLabel = "payroll"

if orgLabel:
    print(orgLabel)
end
```



## Conditionals

```
orgLabel = "payroll"

if orgLabel:
    print(orgLabel)
else:
    print("nothing")
end
```

## Conditionals

```
orgLabel = "payroll"

if orgLabel:
    print(orgLabel)
else if orgLabel=="hr":
    print("human resources")
else:
    print("nothing")
end
```

## Conditionals

```
apiVersion: v1
kind: Service
metadata:
  name: {{ .Release.Name }}-nginx
  {{- if .Values.orgLabel }}
  labels:
    org: {{ .Values.orgLabel }}
  {{- end }}
spec:
  ports:
    - port: 80
      name: http
  selector:
    app: hello-world
```

service.yaml

## Conditionals

```
apiVersion: v1
kind: Service
metadata:
  name: {{ .Release.Name }}-nginx
  {{- if .Values.orgLabel }}
  labels:
    org: {{ .Values.orgLabel }}
  {{- else if eq .Values.orgLabel "hr" }}
  labels:
    org: human resources
  {{- end }}
spec:
  ports:
    - port: 80
      name: http
  selector:
    app: hello-world
```

service.yaml

Function	Purpose
eq	equal
ne	not equal
lt	less than
le	less than or equal to
gt	greater than
ge	greater than or equal to
not	negation
empty	value is empty

## Example

```
# Default values for nginx-chart.
# This is a YAML-formatted file.

serviceAccount:
  # Specifies whether a ServiceAccount should be created
  create: true
```

values.yaml

```
{{- if .Values.serviceAccount.create }}

apiVersion: v1
kind: ServiceAccount
metadata:
  name: {{ .Release.Name }}-robot-sa

{{- else }}
```

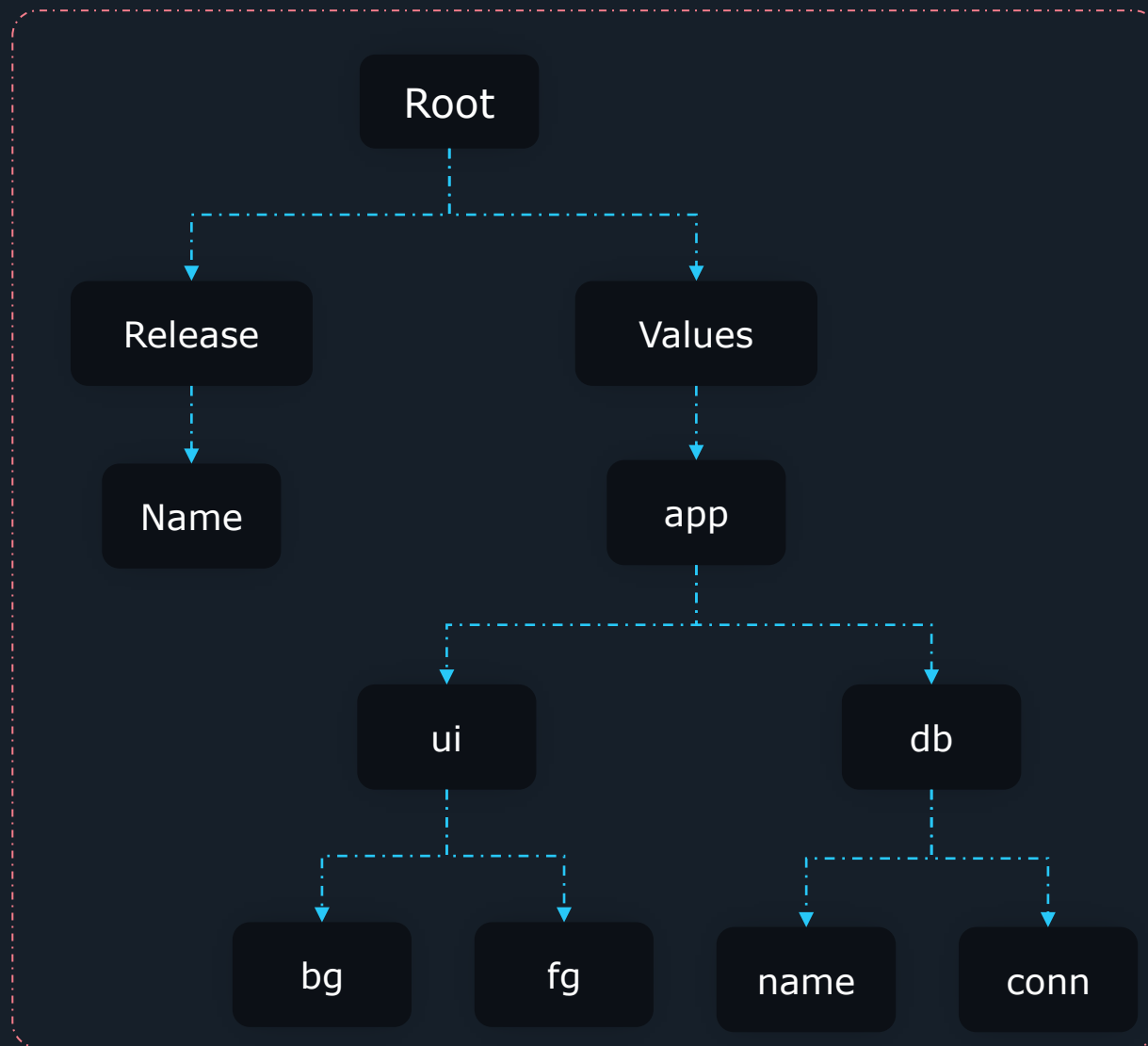
serviceaccount.yaml

Setting scope using With



```
app:                                     values.yaml
  ui:
    bg: red
    fg: black
  db:
    name: "users"
    conn: "mongodb://localhost:27020/mydb"
```

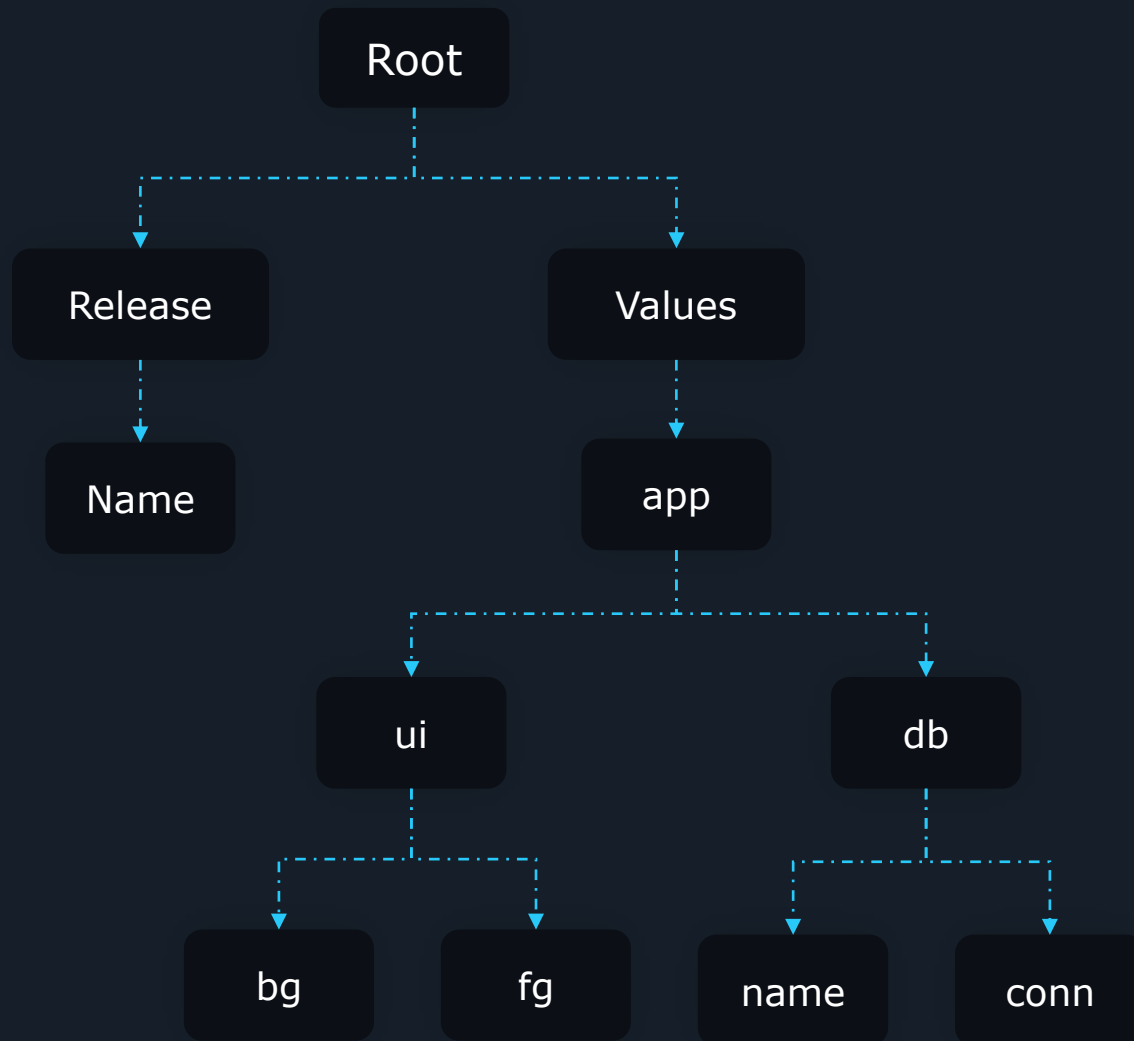
```
apiVersion: v1                         configmap.yaml
kind: ConfigMap
metadata:
  name:      {{ .Release.Name }}-appinfo
data:
  background: {{ .Values.app.ui.bg }}
  foreground: {{ .Values.app.ui.fg }}
  database:   {{ .Values.app.db.name }}
  connection: {{ .Values.app.db.conn }}
```



```
configmap.yaml
apiVersion: v1
kind: ConfigMap
metadata:
  name: {{ .Release.Name }}-appinfo
data:
  background: {{ .Values.app.ui.bg }}
  foreground: {{ .Values.app.ui.fg }}
  database: {{ .Values.app.db.name }}
  connection: {{ .Values.app.db.conn }}
```

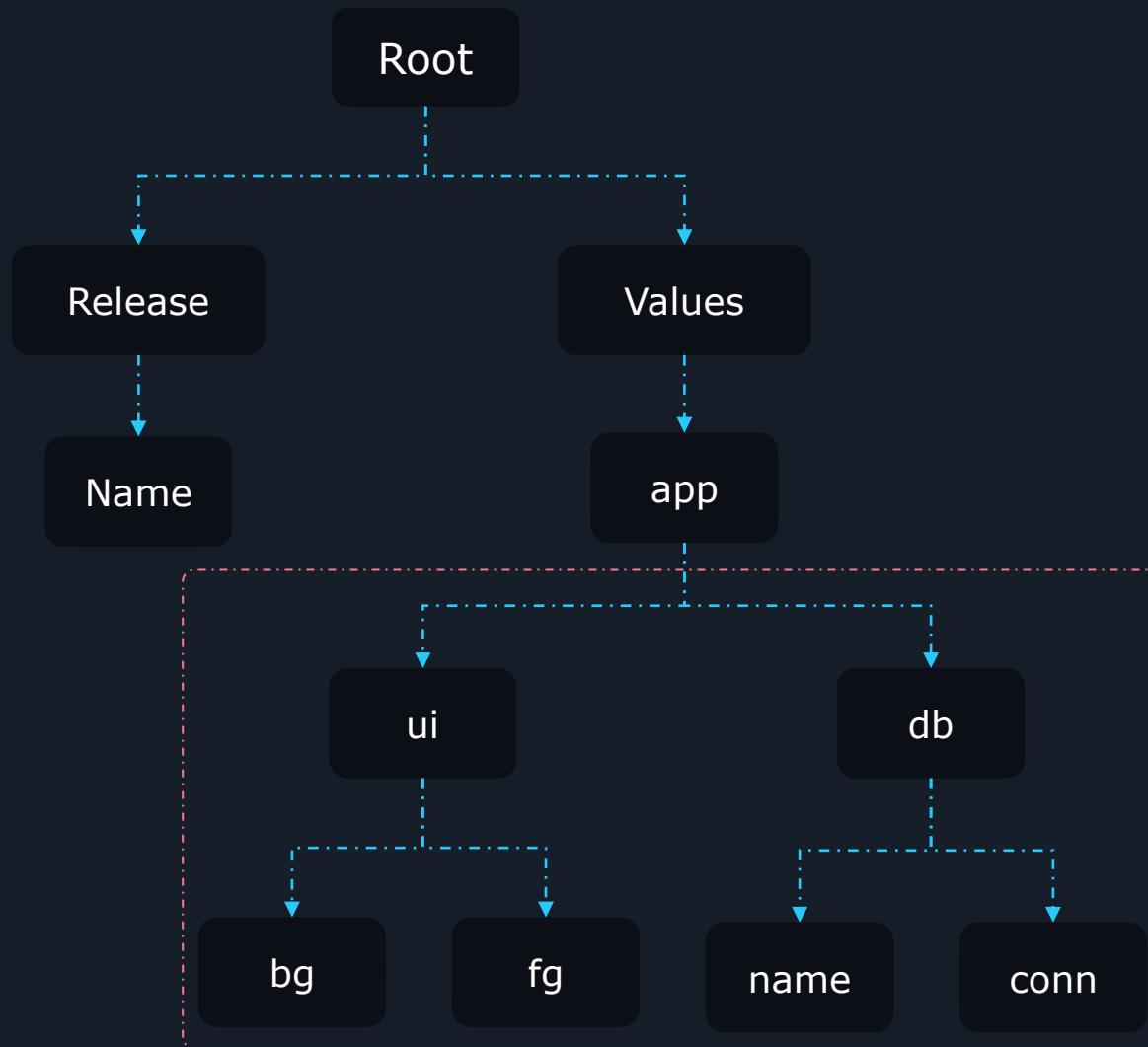


With



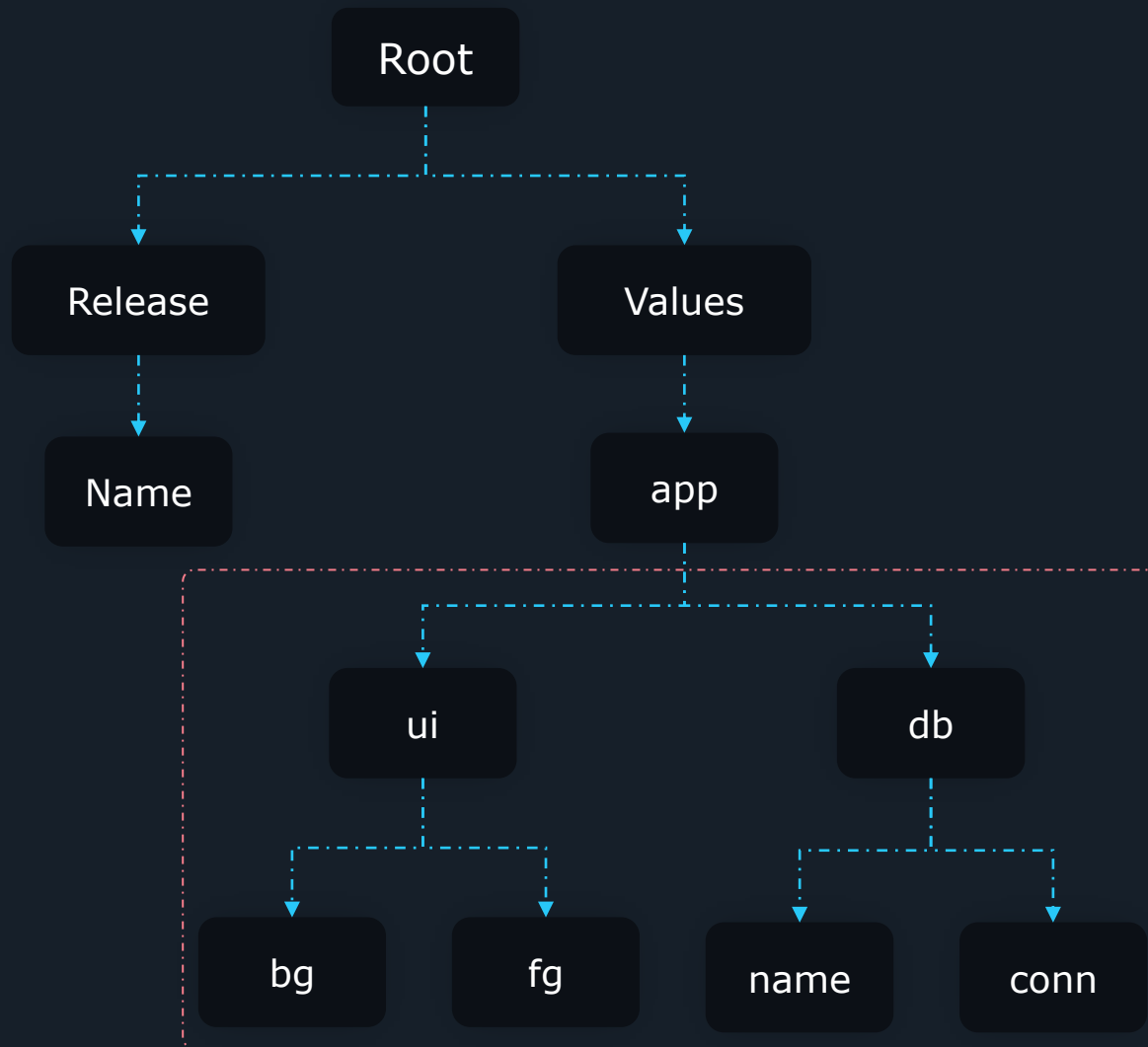
```
apiVersion: v1                                configmap.yaml
kind: ConfigMap
metadata:
  name:      {{ .Release.Name }}-appinfo
data:
  {{- with .Values.app }}
  background: {{ .Values.app.ui.bg }}
  foreground: {{ .Values.app.ui.fg }}
  database:   {{ .Values.app.db.name }}
  connection: {{ .Values.app.db.conn }}
  {{- end }}
```

With



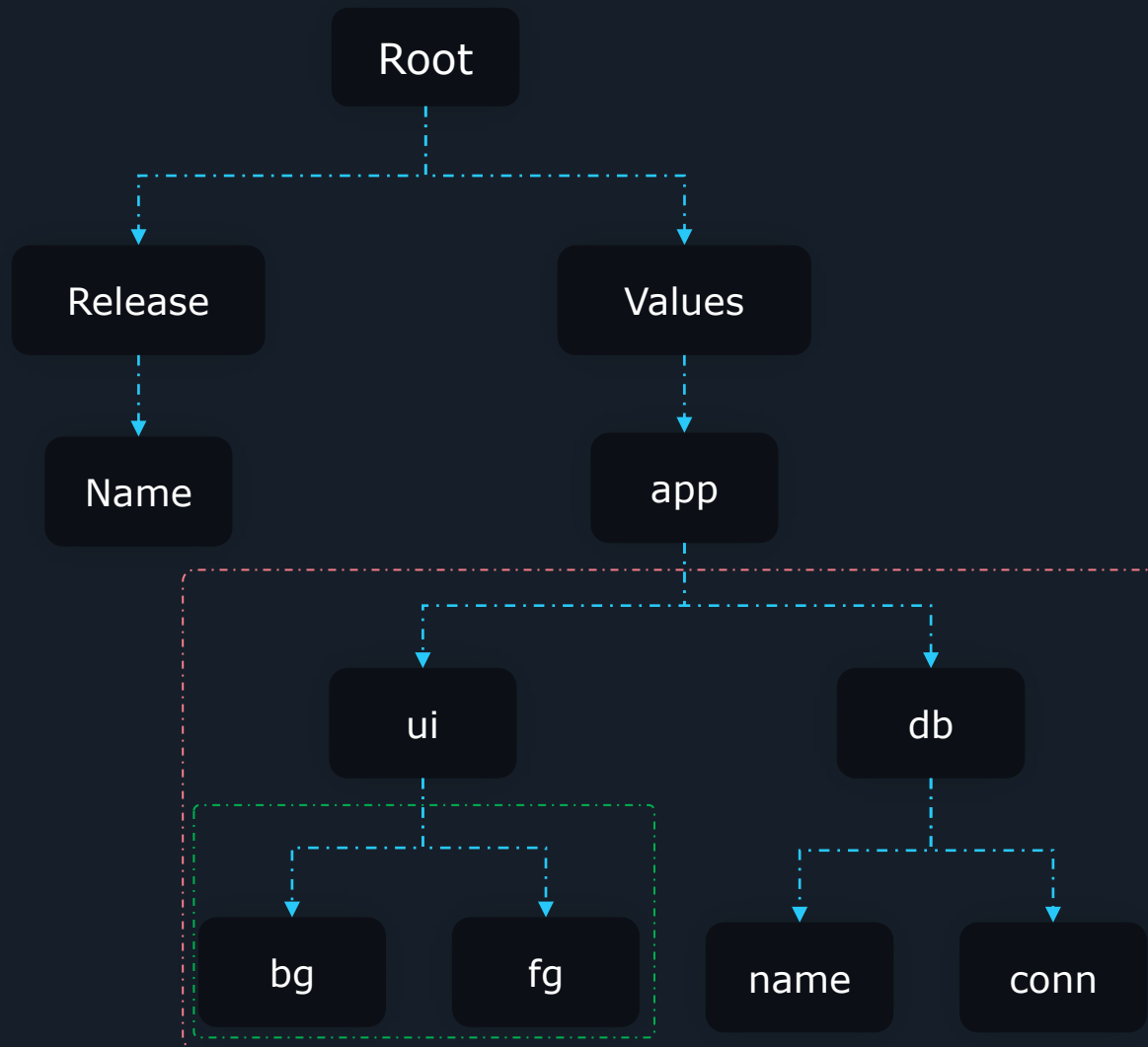
```
apiVersion: v1                                configmap.yaml
kind: ConfigMap
metadata:
  name:      {{ .Release.Name }}-appinfo
data:
  {{- with .Values.app }}
  background: {{          .ui.bg }}
  foreground: {{          .ui.fg }}
  database:   {{          .db.name }}
  connection: {{          .db.conn }}
  {{- end }}
```

With



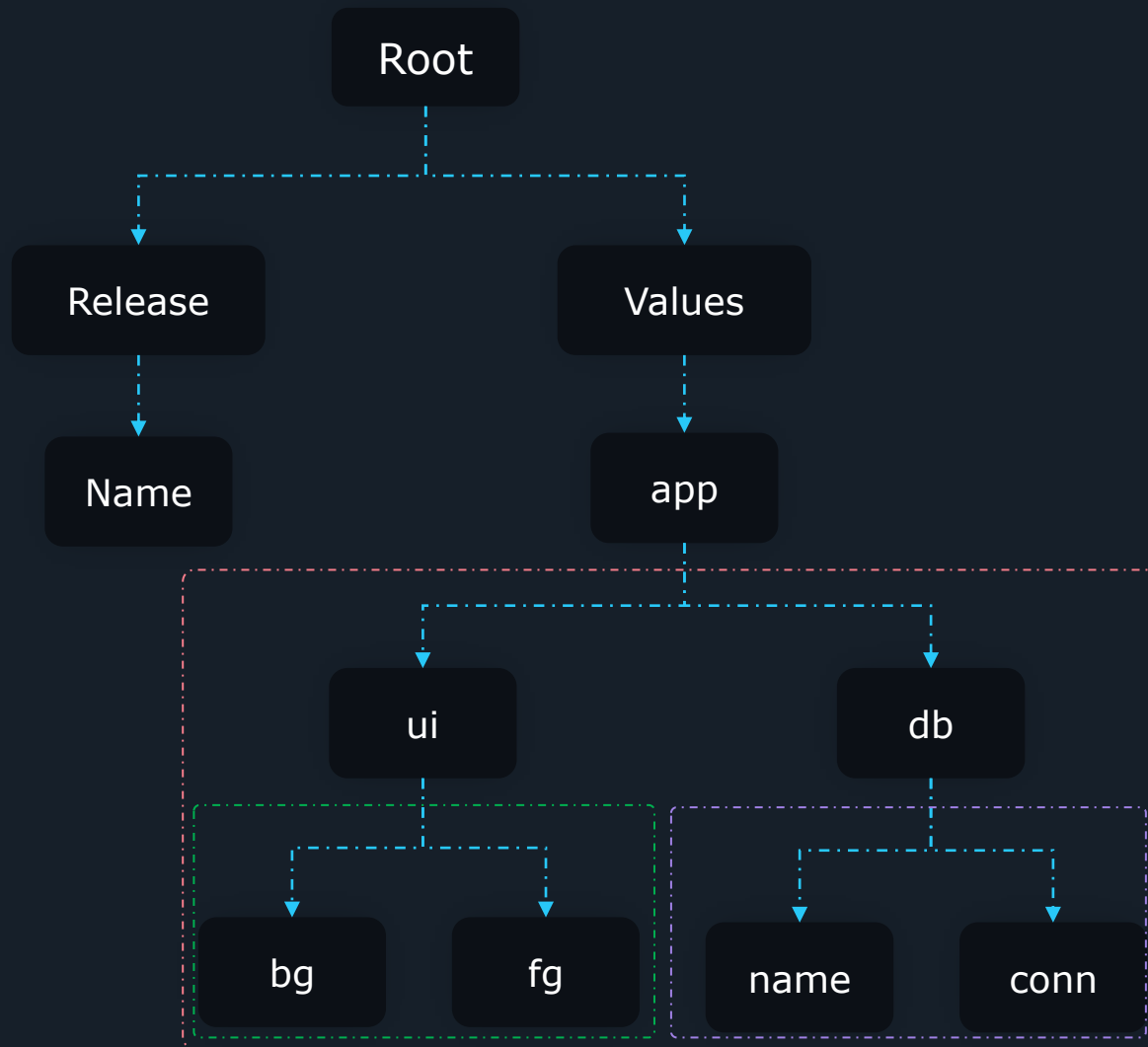
```
apiVersion: v1                                configmap.yaml
kind: ConfigMap
metadata:
  name:      {{ .Release.Name }}-appinfo
data:
  {{- with .Values.app }}
    {{- with .ui }}
      background: {{          .ui.bg }}
      foreground: {{          .ui.fg }}
    {{- end }}
    database:     {{          .db.name }}
    connection:  {{          .db.conn }}
  {{- end }}
```

With



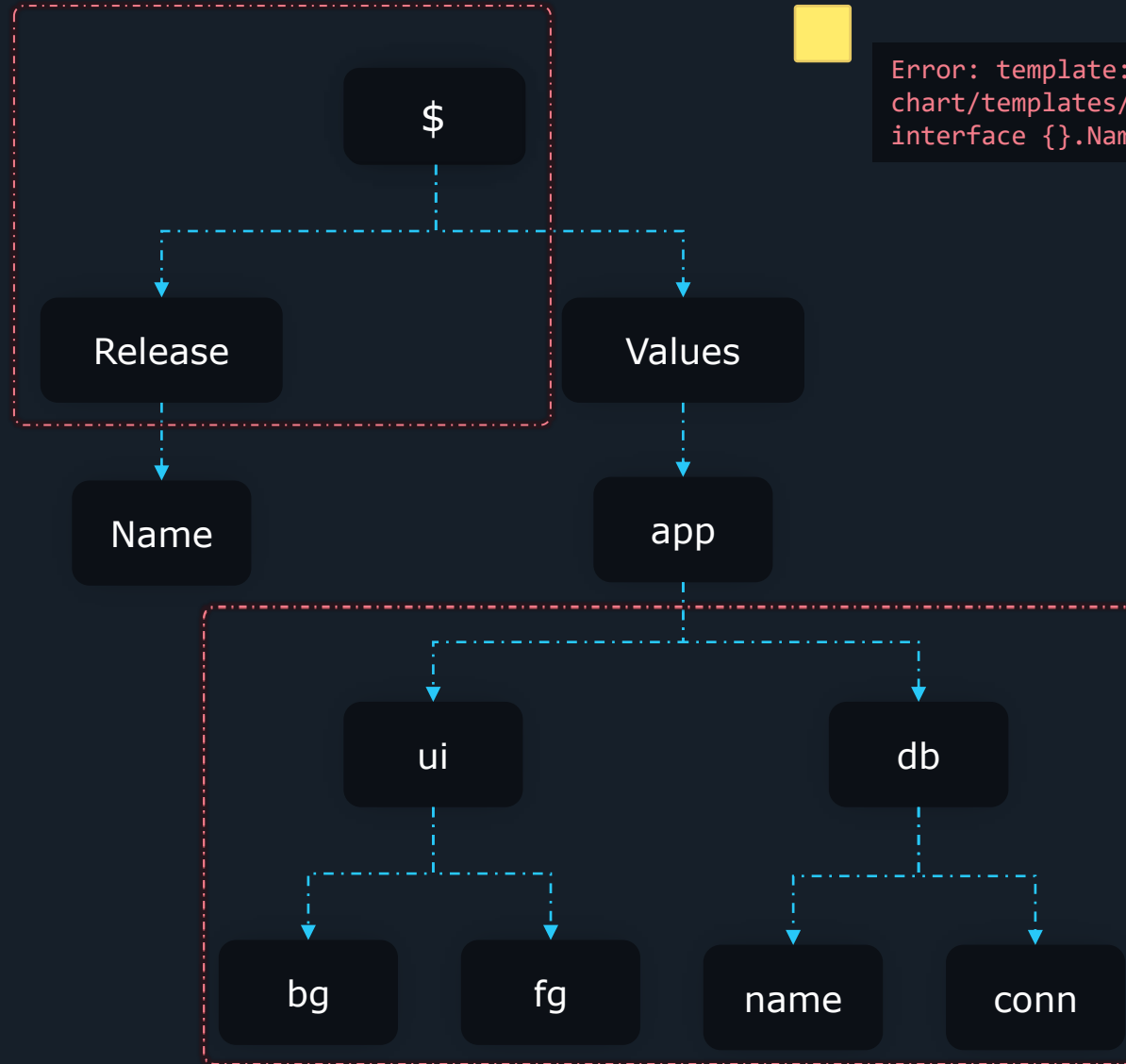
```
apiVersion: v1                                configmap.yaml
kind: ConfigMap
metadata:
  name:      {{ .Release.Name }}-appinfo
data:
  {{- with .Values.app }}
    {{- with .ui }}
      background: {{ .bg }}
      foreground: {{ .fg }}
    {{- end }}
    database:     {{ .db.name }}
    connection:   {{ .db.conn }}
  {{- end }}
```

With



```
apiVersion: v1                                configmap.yaml
kind: ConfigMap
metadata:
  name:      {{ .Release.Name }}-appinfo
data:
  {{- with .Values.app }}
    {{- with .ui }}
      background: {{ .bg }}
      foreground: {{ .fg }}
    {{- end }}
    {{- with .db }}
      database: {{ .name }}
      connection: {{ .conn }}
    {{- end }}
  {{- end }}
```

With



Error: template: nginx-chart/templates/cfg.yaml:15:24: executing "nginx-chart/templates/cfg.yaml" at <.Release.Name>: nil pointer evaluating interface {}.Name

```
apiVersion: v1                                configmap.yaml
kind: ConfigMap
metadata:
  name:      {{ .Release.Name }}-appinfo
data:
  {{- with .Values.app }}
    {{- with .ui }}
      background: {{ .bg }}
      foreground: {{ .fg }}
    {{- end }}
    {{- with .db }}
      database: {{ .name }}
      connection: {{ .conn }}
    {{- end }}
  release: {{ $.Release.Name }}
  {{- end }}
```

Range



## Loops

1	i
2	i
3	i
4	i
5	i
6	i
7	i
8	i
9	i
10	i



```
for i in 1 to 10:  
    print i  
end
```

1
2
3
4
5
6
7
8
9
10



```
regions: values.yaml
- ohio
- newyork
- ontario
- london
- singapore
- mumbai
```

```
apiVersion: v1 configmap.yaml
kind: ConfigMap
metadata:
  name: RELEASE-NAME-regioninfo
data:
  regions:
    - "ohio"
    - "newyork"
    - "ontario"
    - "london"
    - "singapore"
    - "mumbai"
```

## Range

```
regions: values.yaml
```

- ohio
- newyork
- ontario
- london
- singapore
- mumbai



```
apiVersion: v1
kind: ConfigMap
metadata:
  name: {{ .Release.Name }}-regioninfo
data:
  regions:
    {{- range .Values.regions }}
    - {{ . | quote }}
    {{- end }}
```

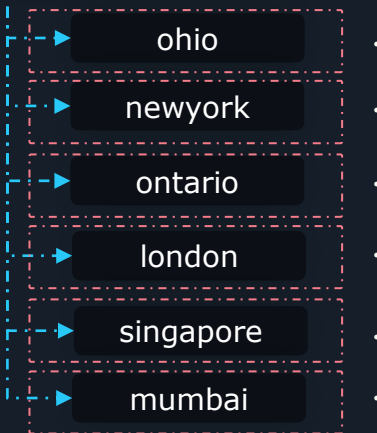
```
apiVersion: v1
kind: ConfigMap
metadata:
  name: RELEASE-NAME-regioninfo
data:
  regions:
    - "ohio"
    - "newyork"
    - "ontario"
    - "london"
    - "singapore"
    - "mumbai"
```

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: RELEASE-NAME-regioninfo
data:
  regions:
    - "ohio"
    - "newyork"
    - "ontario"
    - "london"
    - "singapore"
    - "mumbai"
```

\$

Values

regions



Named Templates



```
apiVersion: v1                                service.yaml
kind: Service
metadata:
  name: {{ .Release.Name }}-nginx
  labels:
    app.kubernetes.io/name: nginx
    app.kubernetes.io/instance: nginx
spec:
  ports:
    - port: 80
      targetPort: http
      protocol: TCP
      name: http
  selector:
    app: hello-world
```

```
apiVersion: apps/v1                            deployment.yaml
kind: Deployment
metadata:
  name: {{ .Release.Name }}-nginx
  labels:
    app.kubernetes.io/name: nginx
    app.kubernetes.io/instance: nginx
spec:
  selector:
    matchLabels:
      app.kubernetes.io/name: nginx
      app.kubernetes.io/instance: nginx
  template:
    metadata:
      labels:
        app.kubernetes.io/name: nginx
        app.kubernetes.io/instance: nginx
    spec:
      containers:
        - name: nginx
          image: "nginx:1.16.0"
          imagePullPolicy: IfNotPresent
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```

## Template

```
{{- define "labels" }}
```

```
  app.kubernetes.io/name: {{ .Release.Name }}
  app.kubernetes.io/instance: {{ .Release.Name }}
{{- end }}
```

\_helpers.tpl

templates

- \_helpers.tpl
- cfg.yaml
- deployment.yaml
- service.yaml

```
apiVersion: v1
kind: Service
metadata:
  name: {{ .Release.Name }}-nginx
  labels:
    {{- template "labels" . }}
spec:
  ports:
    - port: 80
      targetPort: http
      protocol: TCP
      name: http
  selector:
    app: hello-world
```

service.yaml

```
apiVersion: v1
kind: Service
metadata:
  name: nginx-release-nginx
  labels:
    app.kubernetes.io/name:
    app.kubernetes.io/instance:
spec:
  ports:
    - port: 80
      targetPort: http
      protocol: TCP
      name: http
  selector:
    app: hello-world
```

service.yaml

## Template

```
                                _helpers.tpl
{{- define "labels" }}
    app.kubernetes.io/name: {{ .Release.Name }}
    app.kubernetes.io/instance: {{ .Release.Name }}
{{- end }}
```

template	action
include	function

```
deployment.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: {{ .Release.Name }}-nginx
  labels:
    {{- template "labels" . }}
spec:
  selector:
    matchLabels:
      {{- include "labels" . | indent 2 }}
  template:
    metadata:
      labels:
        {{- include "labels" . | indent 4 }}
    spec:
      containers:
        - name: nginx
          image: "nginx:1.16.0"
          imagePullPolicy: IfNotPresent
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```

```
deployment.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: RELEASE-NAME-nginx
  labels:
    app.kubernetes.io/name: nginx-chart
    app.kubernetes.io/instance: nginx-release
spec:
  selector:
    matchLabels:
      app.kubernetes.io/name: nginx-chart
      app.kubernetes.io/instance: nginx-release
  template:
    metadata:
      labels:
        app.kubernetes.io/name: nginx-chart
        app.kubernetes.io/instance: nginx-release
    spec:
      containers:
        - name: nginx
          image: "nginx:1.16.0"
          imagePullPolicy: IfNotPresent
          ports:
            - name: http
              containerPort: 80
              protocol: TCP
```

template is an action, and not a function, there is no way to pass the output of a template call to other functions; the data is simply inserted inline.

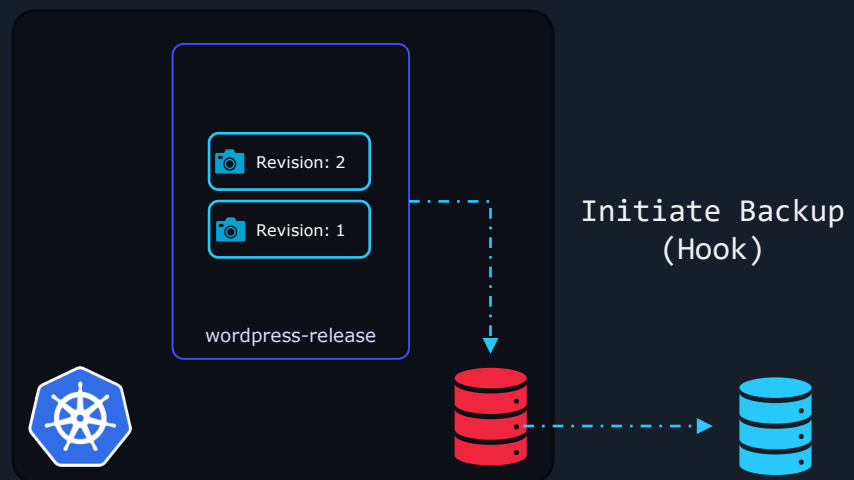
<https://stackoverflow.com/questions/71086697/how-does-template-and-include-differ-in-helm>

Chart Hooks





```
$ helm upgrade wordpress-release bitnami/wordpress
```





```
$ helm upgrade
```

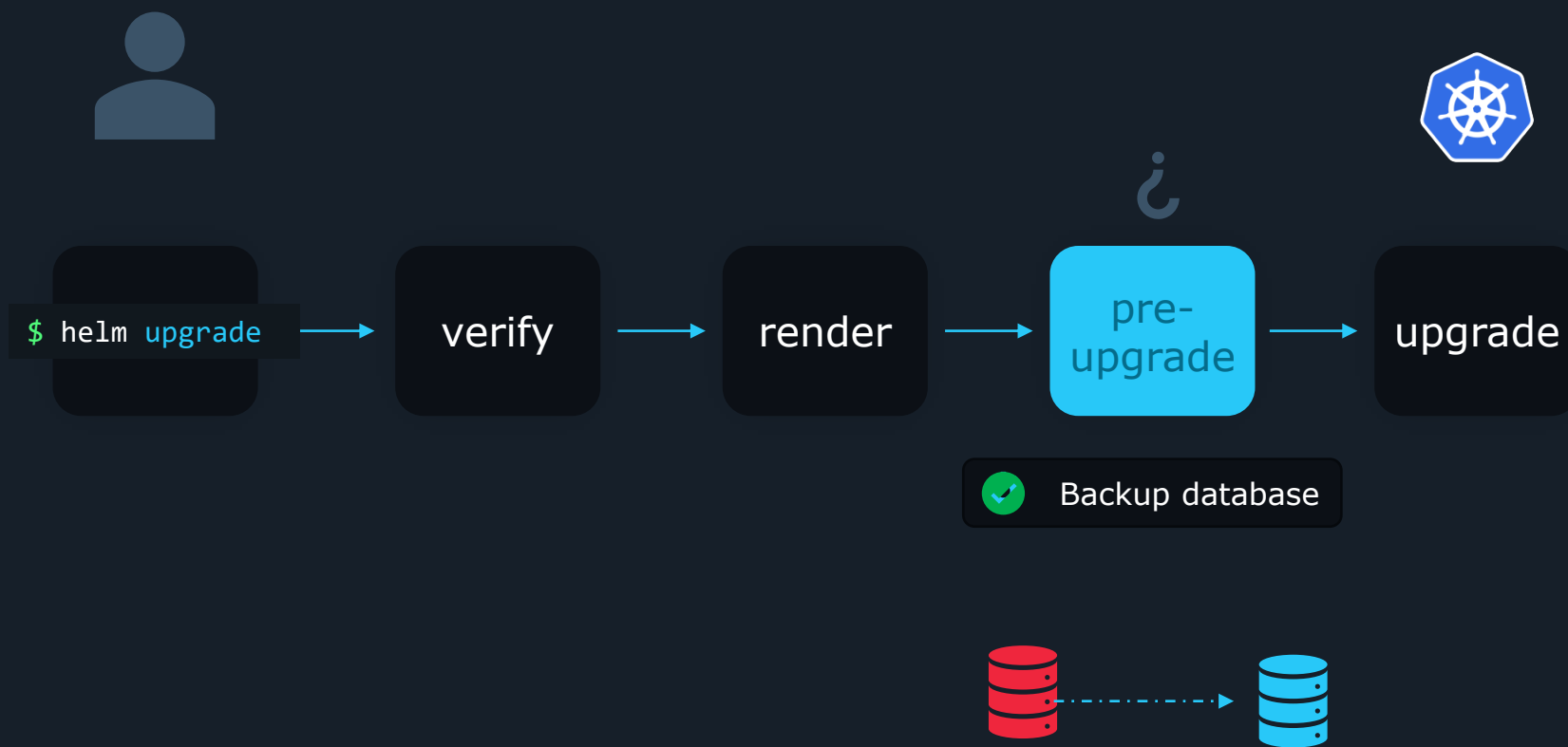
verify

render

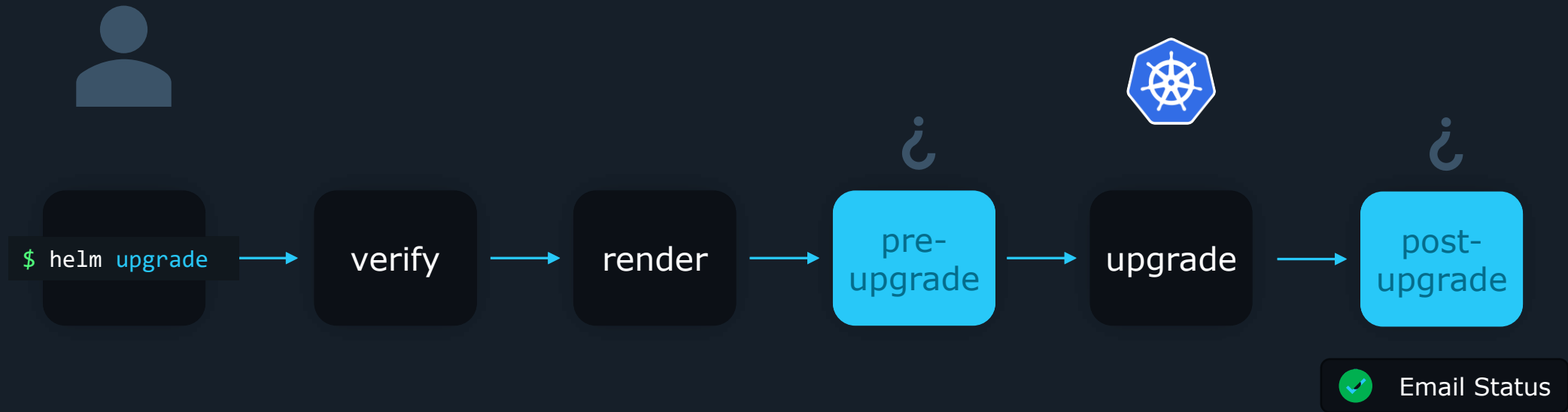
upgrade



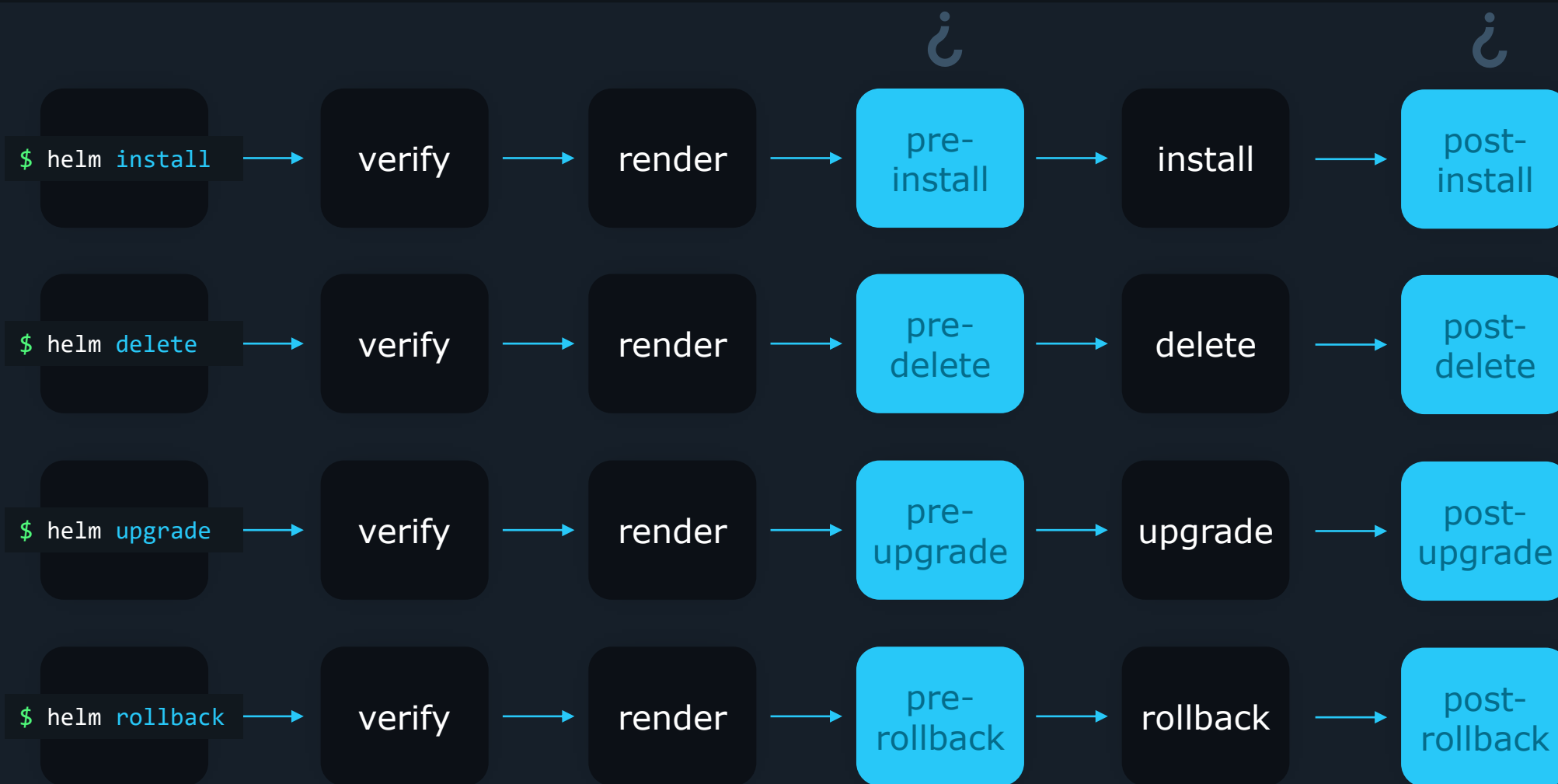
## pre-upgrade hook



## post-upgrade hook



## hooks



## Creating Hooks

hello-world-chart

templates

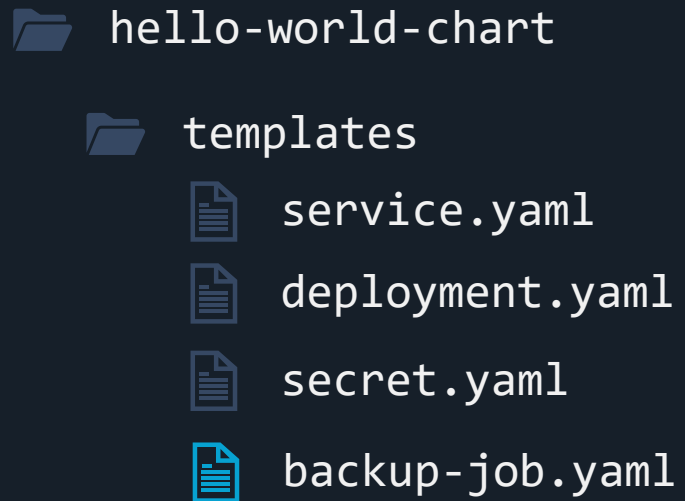
- service.yaml
- deployment.yaml
- secret.yaml
- backup-job.yaml

pre-  
upgrade

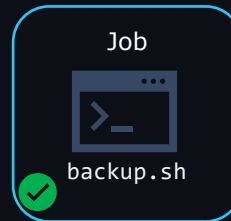


```
apiVersion: batch/v1      backup-job.yaml
kind: Job
metadata:
  name: {{ .Release.Name }}-nginx
spec:
  template:
    metadata:
      name: {{ .Release.Name }}-nginx
    spec:
      restartPolicy: Never
      containers:
      - name: pre-upgrade-backup-job
        image: "alpine"
        command: ["/bin/backup.sh"]
```

## Creating Hooks



pre-  
upgrade

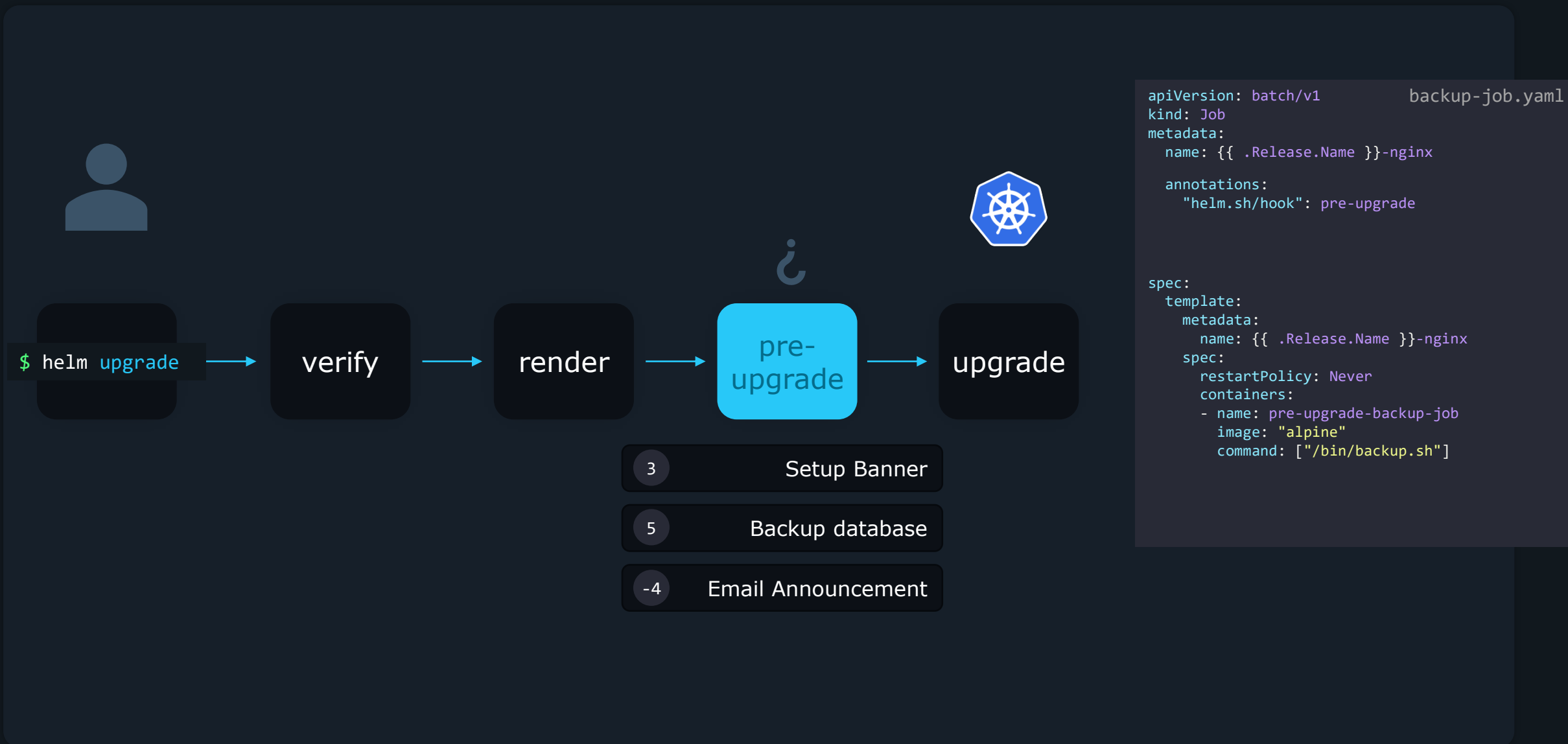


```
apiVersion: batch/v1      backup-job.yaml
kind: Job
metadata:
  name: {{ .Release.Name }}-nginx

  annotations:
    "helm.sh/hook": pre-upgrade

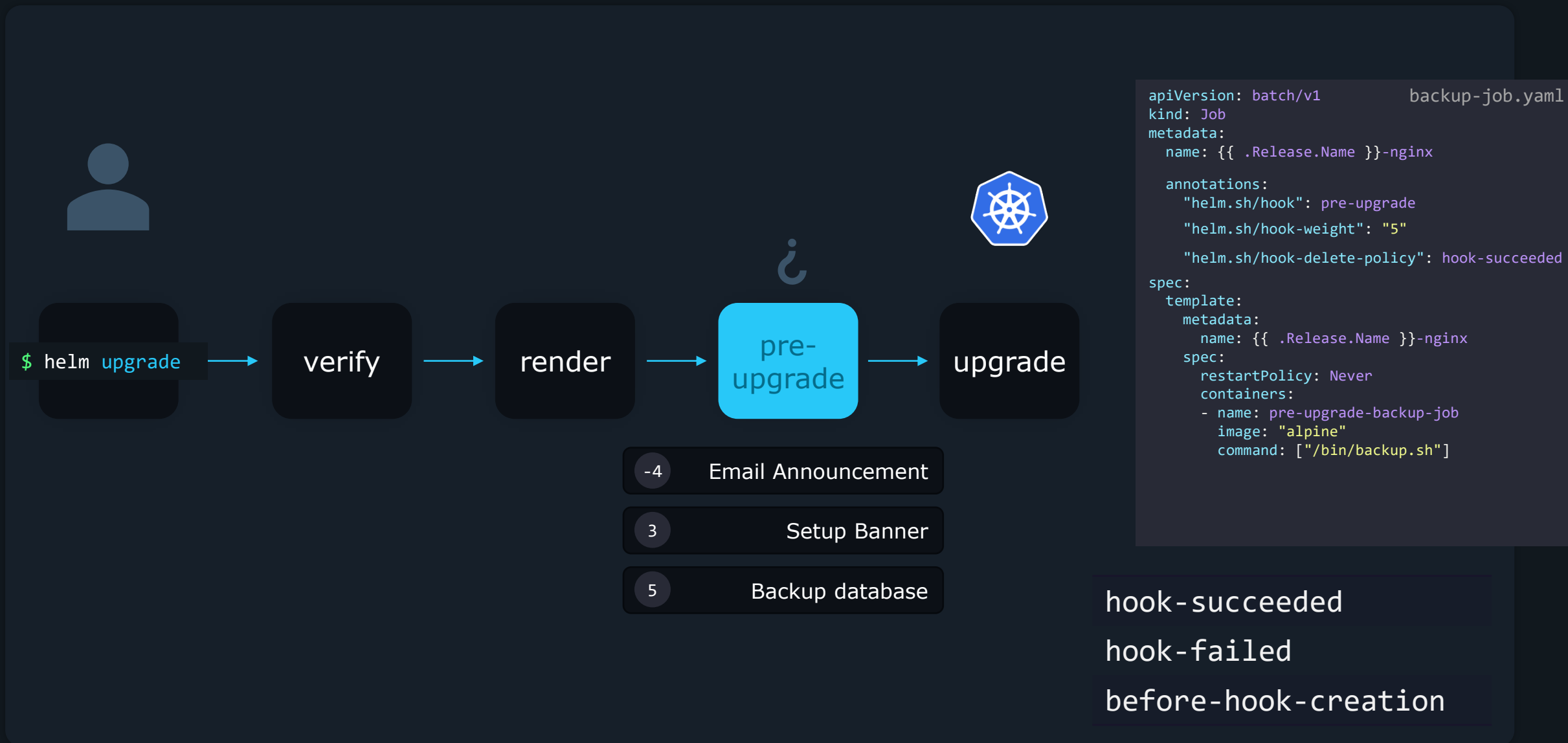
spec:
  template:
    metadata:
      name: {{ .Release.Name }}-nginx
    spec:
      restartPolicy: Never
      containers:
        - name: pre-upgrade-backup-job
          image: "alpine"
          command: ["/bin/backup.sh"]
```

## pre-upgrade hook





## pre-upgrade hook



## Packaging and Signing Charts



## Packaging & Uploading



Online Chart Repository



> \_

```
$ ls nginx-chart
```

```
charts  Chart.yaml  templates  values.yaml  README.md  
LICENSE
```

```
$ helm package ./nginx-chart
```

```
Successfully packaged chart and saved it to:  
/vagrant/nginx-chart-0.1.0.tgz
```



## Helm Provenance and Integrity

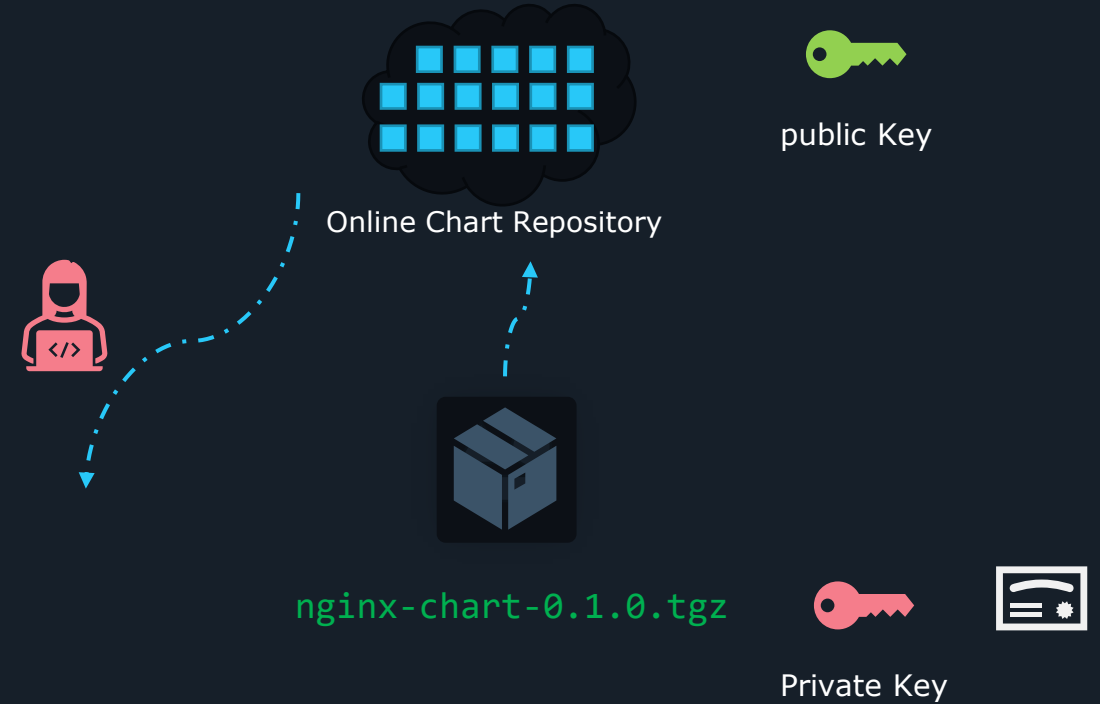
> \_

```
$ ls nginx-chart
```

```
charts  Chart.yaml  templates  values.yaml  README.md  
LICENSE
```

```
$ helm package ./nginx-chart
```

```
Successfully packaged chart and saved it to:  
/vagrant/nginx-chart-0.1.0.tgz
```



## Packaging

> \_

```
$ gpg --quick-generate-key "John Smith"
```

```
gpg: keybox '/home/vagrant/.gnupg/pubring.kbx' created
About to create a key for:
    "John Smith"
```

```
Continue? (Y/n) Y
```

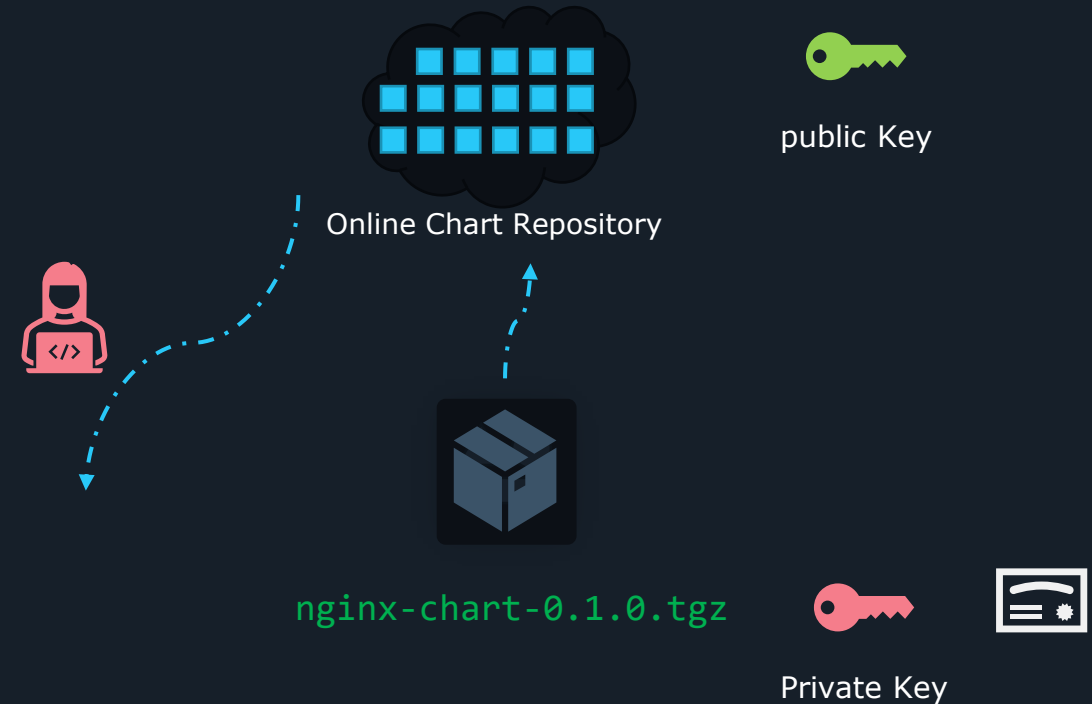
```
gpg: /home/vagrant/.gnupg/trustdb.gpg: trustdb created
gpg: key 70D5188339885A0B marked as ultimately trusted
gpg: directory '/home/vagrant/.gnupg/openpgp-revocs.d' created
gpg: revocation certificate stored as
    '/home/vagrant/.gnupg/openpgp-
revocs.d/20F2395A3176A22DD33DA45470D5188339885A0B.rev'
public and secret key created and signed.
```

```
pub   rsa3072 2021-12-01 [SC] [expires: 2023-12-01]
       20F2395A3176A22DD33DA45470D5188339885A0B
uid           John Smith
sub   rsa3072 2021-12-01 [E]
```

```
# gpg --full-generate-key "John Smith"
```

```
$ gpg --export-secret-keys > ~/.gnupg/secring.gpg
```

```
gpg: starting migration from earlier GnuPG versions
gpg: porting secret keys from
    '/home/vagrant/.gnupg/secring.gpg' to gpg-agent
gpg: migration succeeded
```



## Signing and Verifying Helm Charts

>\_

```
$ helm package --sign --key 'John Smith' --keyring ~/.gnupg/secring.gpg ./nginx-chart
```

Successfully packaged chart and saved it to: /vagrant/nginx-chart-0.1.0.tgz

```
$ gpg --list-keys
```

```
gpg: checking the trustdb
gpg: marginals needed: 3 completes needed: 1 trust model:
pgp
gpg: depth: 0 valid: 1 signed: 0 trust: 0-, 0q, 0n,
0m, 0f, 1u
gpg: next trustdb check due at 2023-12-01
/home/vagrant/.gnupg/pubring.kbx
-----
pub   rsa3072 2021-12-01 [SC] [expires: 2023-12-01]
      20F2395A3176A22DD33DA45470D5188339885A0B
uid           [ultimate] John Smith
sub   rsa3072 2021-12-01 [E]
```

## Provenance File

> \_

\$ ls

nginx-chart nginx-chart-0.1.0.tgz nginx-chart-0.1.0.tgz.prov

\$ ls

-----BEGIN PGP SIGNED MESSAGE-----

Hash: SHA512

apiVersion: v2

appVersion: 1.16.0

description: A Helm chart for Kubernetes

maintainers:

- - email: john@example.com

name: john smith

name: nginx-chart

type: application

version: 0.1.0

...

files:

nginx-chart-0.1.0.tgz: sha256:b7d05022a9617ab953a3246bc7ba6a9de9d4286b2e78e3ea7975cc54698c4274

-----BEGIN PGP SIGNATURE-----

...

=kser

-----END PGP SIGNATURE-----

\$ sha256sum nginx-chart-0.1.0.tgz

b7d05022a9617ab953a3246bc7ba6a9de9d4286b2e78e3ea7975cc54698c4274 nginx-chart-0.1.0.tgz



## Verify Signature

>\_

```
$ helm verify ./nginx-chart-0.1.0.tgz
```

```
Error: failed to load keyring: open /home/vagrant/.gnupg/pubring.gpg: no such file or directory
```

```
$ gpg --export 'John Smith' > mypublickey
```

```
$ helm verify --keyring ./mypublickey ./nginx-0.1.0.tgz
```

```
Signed by: John Smith
```

```
Using Key With Fingerprint: 20F2395A3176A22DD33DA45470D5188339885A0B
```

```
Chart Hash Verified: sha256:b7d05022a9617ab953a3246bc7ba6a9de9d4286b2e78e3ea7975cc54698c4274
```

```
$ gpg --recv-keys --keyserver keyserver.ubuntu.com 8D40FE0CACC3FED4AD1C217180BA57AAFAAD1CA5
```

```
$ helm install --verify nginx-chart-0.1.0
```

Uploading Charts



index.yaml

> \_

\$ ls

nginx-chart nginx-chart-0.1.0.tgz nginx-chart-0.1.0.tgz.prov

\$ mkdir nginx-chart-files

\$ cp nginx-chart-0.1.0.tgz nginx-chart-0.1.0.tgz.prov nginx-chart-files/

\$ helm repo index nginx-chart-files/ --url https://example.com/charts

\$ ls nginx-chart-files

index.yaml nginx-chart-0.1.0.tgz nginx-chart-0.1.0.tgz.prov

```
apiVersion: v1                                                    index.yaml
entries:
  nginx-chart:
    - apiVersion: v2
      appVersion: 1.16.0
      created: "2021-12-01T15:29:35.073405539Z"
      description: A Helm chart for Kubernetes
      digest: 2c83c29dc4c56d20c45c3de8eff521fbfb6ef6c0b66854a6f4b5539bebcff879
      maintainers:
        - email: john@example.com
          name: john smith
      name: nginx-chart
      type: application
      urls:
        - https://charts.bitnami.com/bitnami/nginx-chart-0.1.0.tgz
      version: 0.1.0
    generated: "2021-12-01T15:29:35.047718855Z"
```



`https://example-charts.storage.googleapis.com`



package



index.yaml



provenance

index.yaml

> \_

```
$ helm repo add our-cool-charts https://example-charts.storage.googleapis.com
```

```
$ helm repo list
```

NAME	URL
bitnami	https://charts.bitnami.com/bitnami
our-cool-charts	https://example-charts.storage.googleapis.com

```
$ helm install my-new-release our-cool-charts/nginx-chart
```

Conclusion



Helm

Installation

Architecture

Charts

Functions

Pipelines

Conditionals

With Blocks

Range

Chart Hooks

Packaging &  
Signing

Uploading