Kubernetes Advanced

kubernetes

Session #06
Helm

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Session Contents

- What is Helm
- How to use Helm
- Helm Charts
- Author your chart

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What is Helm

Motivation

- To deploy your applications, you need to create several manifest files
- When you want to deploy on different target clusters/environments you may need to make minor changes to reflect those differences
- Additionally, you may want to publish your manifest files on a centralized registry to make it available for other people/teams to reuse them
- To achieve this, a package manager-like tool is what you need
- Helm is the Kubernetes Package Manager

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Helm Architecture

- Helm is a tool for managing Kubernetes packages called charts
- Helm can do the following:
  - Create new charts from scratch
  - Package charts into chart archive (tgz) files
  - Interact with chart repositories where charts are stored
  - Install and uninstall charts into an existing Kubernetes cluster
  - Manage the release cycle of charts that have been installed with Helm

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Helm Concepts

- The chart is a bundle of information necessary to create an instance of a Kubernetes application
- The config contains configuration information that can be merged into a packaged chart to create a releasable object.
- A release is a running instance of a chart, combined with a specific config
- Optionally, you may use a registry where you place/publish your charts to be used by other

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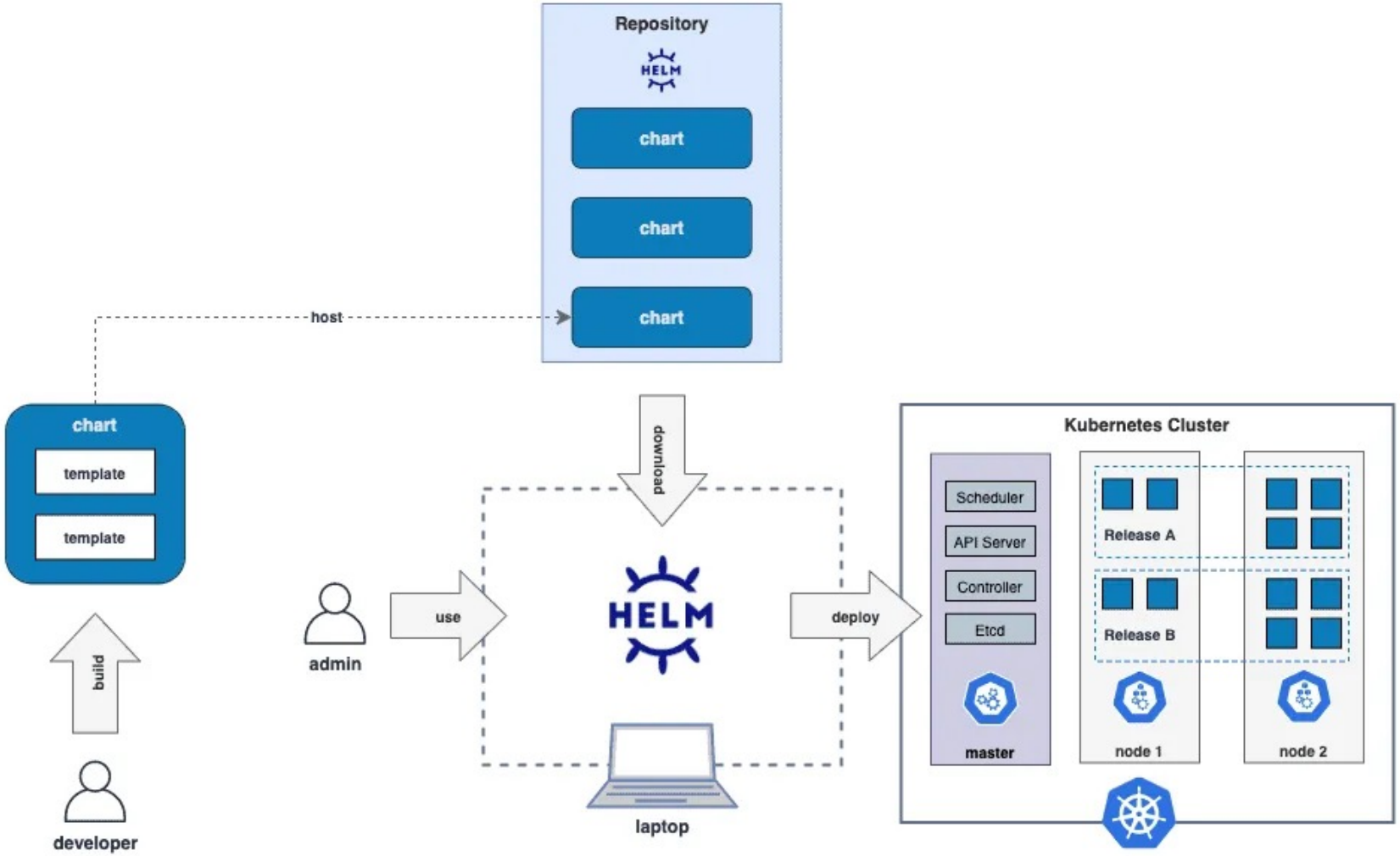
Helm Concepts



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Helm Benefits

- Deployment speed: you can deploy any application available at the Helm chart repository within a single command.
- Prebuilt application configurations: Helm allows you to install community-supported applications with ease.
- Easy rollbacks: Helm allows you to easily roll back your application deployment to the previous version if something goes wrong.

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How to use Helm

Steps to use Helm

1. Install Helm
2. Initialize a Helm Chart Repository
3. Use Helm Chart

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Install Helm

- From Binary Releases
- Using a Helm Installation Script -> Preferable way
- Using Package Manager
  - Brew
  - Chocolatey
  - Apt, Yum, ...

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Initialize a Helm Chart Repository

- Before you run a Helm Chart you need to have access to them
- You can author your charts (next topic) or you can download them
- To download a pre-existing chart, you may connect to a repository
- The way you interact with this repositories are similar the way you use any package manager

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Helm OCI Registries

- OCI (Open Container Initiative) have a registry specification for container images registries
- Helm (on version 3) can use container registries with OCI support to store helm charts
- Several container registries have OCI Support
  - Docker Hub
  - GitHub Packages
  - All cloud providers Container Registries
- Central place to find Helm Charts is ArtifactHUB

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Use Helm Chart

- After getting access to the repository, you may search the helm chart that you want to use
- After knowing is name and version, you install the helm chart on your cluster
- Helm uses your active `kubectl` context configuration (cluster and permissions) to install the Helm Chart

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Helm Chart Values

- To allow a dynamic behavior of a Helm Chart you may set different inputs when installing your Helm Chart
- You can pass those values directly on command line commands
- But to have a consistent way of configure different environments/context you should use Helm Chart Values file

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Demo | Use Helm

Helm Charts

Motivation

- Until now we've used Helm to deploy chart that someone produced, like using Docker Hub to pull images
- Then I want to create my own charts, from my own applications, to make deploys
- After having those charts working, I may (or not) publish them to a registry

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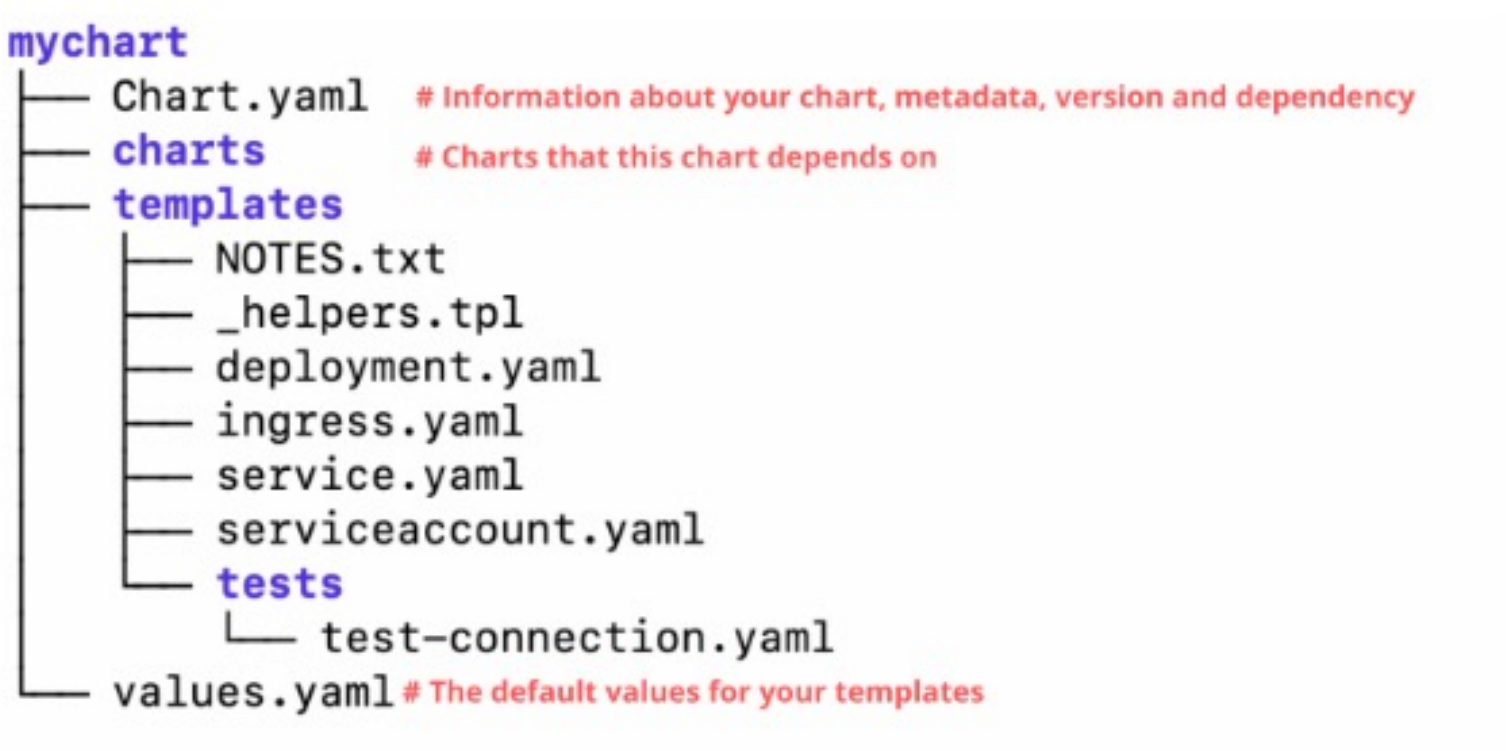
Helm Chart Structure



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Helm: Chart File

- Main file that makes a folder be a Helm Chart folder
- You can see it like chart metadata
- Includes
  - Name
  - Description
  - Chart version
  - App version (different from chart version)

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Helm: values File

- This file allows you to define values (variables) that can be set when someone uses your chart
- Can be more restrictive or more open
- All variables defined where can be used on your templates

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Helm: templates Folder

- Where you define all Kubernetes objects that your application will need
- Are created using a Helm templating language that can use variables to implement dynamic behavior
- Can use functions to add extra features like conditionals and cycles
- Can have as much templates as needed to create all Kubernetes resources
- This files uses Go templating to make it fully dynamic

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Author your Charts

Helm Templating

- Helm uses Go Templating language
- All template code needs to be placed inside {{ }}
- Everything inside this pattern will be translated automatically and producing a text file
- If you miss the format or the code inside it you'll an error an the template will not be produced
- Again, biggest issue is about YAML indentation

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Templates: Built-in Objects

- Some static built-in objects can be used to retrieve information from Helm details
- `Release`: This object describes the release itself
- `Values`: Values passed into the template from the `values.yaml` file and from user-supplied files
- `Chart`: The contents of the `Chart.yaml` file. Any data in `Chart.yaml` will be accessible here.

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Templates: Built-in Objects

```yaml
apiVersion: v1
kind: ConfigMap
metadata:
  name: {{ .Release.Name }}-configmap
data:
  myvalue: "Hello World"
  drink: {{ .Values.favoriteDrink }}
```

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Templates: Built-in Objects

```yaml
# values.yml

favorite:
  drink: coffee
  food: pizza
```

```yaml
apiVersion: v1
kind: ConfigMap
metadata:
  name: {{ .Release.Name }}-configmap
data:
  myvalue: "Hello World"
  drink: {{ .Values.favorite.drink }}
  food: {{ .Values.favorite.food }}
```

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Templates: Functions

- You can use built-in function on templating using 2 approaches

```yaml
apiVersion: v1
kind: ConfigMap
metadata:
  name: {{ .Release.Name }}-configmap
data:
  myvalue: "Hello World"
  drink: {{ quote .Values.favorite.drink }}
  food: {{ quote .Values.favorite.food }}
```

```yaml
apiVersion: v1
kind: ConfigMap
metadata:
  name: {{ .Release.Name }}-configmap
data:
  myvalue: "Hello World"
  drink: {{ .Values.favorite.drink | quote }}
  food: {{ .Values.favorite.food | quote }}
```

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Templates: Functions

- Pipelines is a great solution because allow you to create a chain of function call
- The input of a function is the output of the previous on the chain

```
drink: {{ .Values.favorite.drink | default "tea" | quote }}
```

- [Helm | Template Function List]

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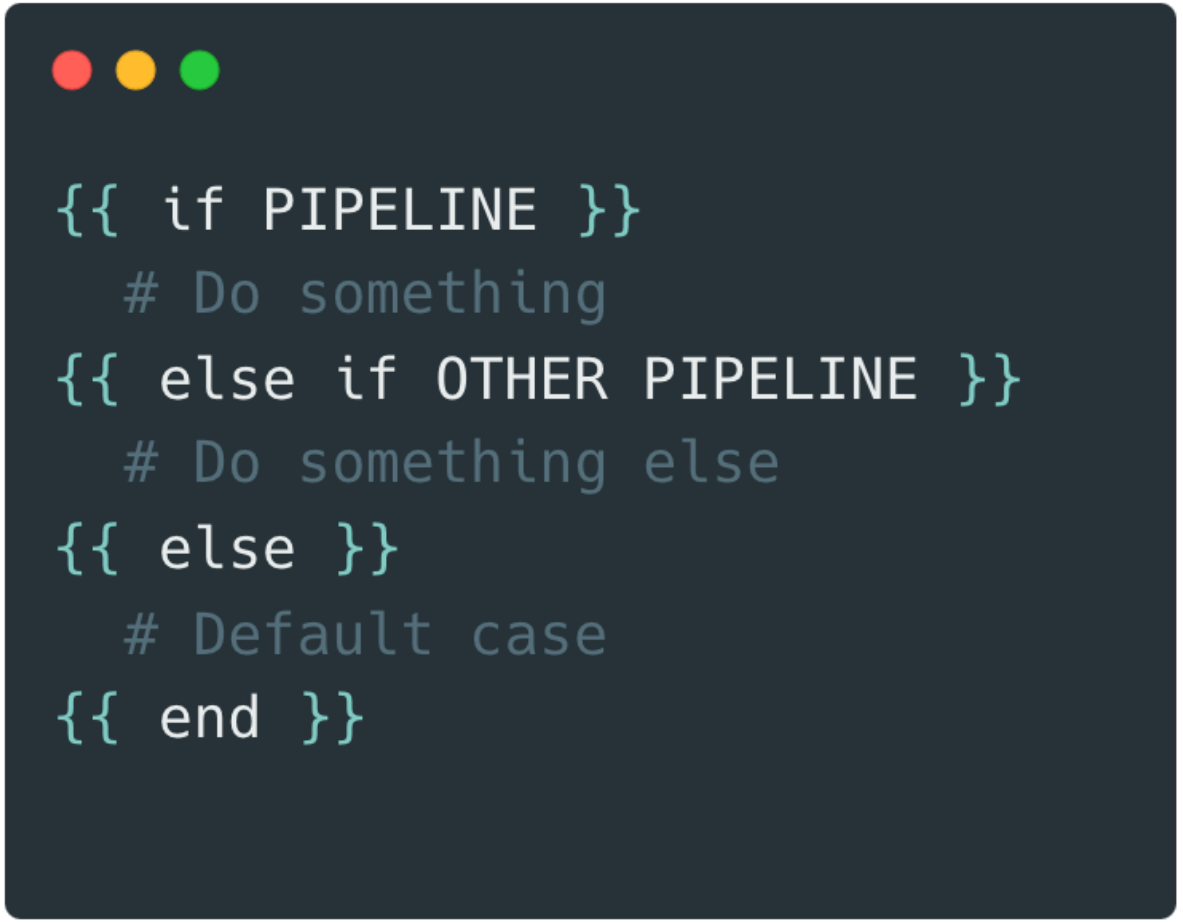
Templates: If/Else



```
{{ if PIPELINE }}
  # Do something
{{ else if OTHER PIPELINE }}
  # Do something else
{{ else }}
  # Default case
{{ end }}
```

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Templates: If/Else

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Templates: Handle whitespaces

- The templates need to be produced using the YAML indentation in mind
- Not the right indentation level or empty lines should be give errors
- You may use `{{-` and `-}}` to clean whitespaces from left or right (newline is a whitespace)

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Templates: Handle Whitespaces

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: {{ .Release.Name }}-configmap
data:
  myvalue: "Hello World"
  drink: {{ .Values.favorite.drink | default "tea" | quote }}
  food: {{ .Values.favorite.food | upper | quote }}
  {{- if eq .Values.favorite.drink "coffee" }}
  mug: "true"
  {{- end }}
```

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Templates: With (scope)

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: {{ .Release.Name }}-configmap
data:
  myvalue: "Hello World"
  {{- with .Values.favorite }}
  drink: {{ .drink | default "tea" | quote }}
  food: {{ .food | upper | quote }}
  {{- end }}
```

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Templates: With (scope)

```
{{- with .Values.resources }}
resources:
  {{- toYaml . | nindent 12 }}
{{- end }}
```

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Templates: Named Templates

- Helm chart create a file called `_helpers.tpl` that allow you to create named templates
- Those are helpful for you to reuse in several templates
- Follow all rules and format defined before

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Templates: Named Template

```
{{- define "mychart.labels" }}
  labels:
    generator: helm
    date: {{ now | htmlDate }}
{{- end }}
```

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: {{ .Release.Name }}-configmap
  {{- template "mychart.labels" }}
data:
  myvalue: "Hello World"
```

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Templates: Debugging

- `helm lint`: For verifying that your chart follows best practices
- `helm template --debug`: will test rendering chart templates locally.
- `helm install --dry-run --debug`: will also render your chart locally without installing it, but will also check if conflicting resources are already running on the cluster.
- `helm get manifest`: This is a good way to see what templates are installed on the server.

Demo | Helm Charts

Questions?

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