Kubernetes Installation and Application Deployment

Summary

Deploy a Kubernetes cluster and leverage Kubernetes Role Based Access Control for users to maintain, access an application in a namespace.

Rationale

This exercise has two goals:

- It helps us to understand what to expect from you as a sales engineer, how do you implement technical stack deployment, how you communicate when trying to understand a problem before you solve it and how do you present it to the audience.
- It helps you get a feel for what it would be like to work at Teleport, as this exercise aims to simulate our day-as-usual and expose you to the type of work we're doing here.

We believe this technique is not only better, but also is more fun compared to whiteboard/quiz interviews so common in the industry.

We're not alone:
http://sockpuppet.org/blog/2015/03/06/the-hiring-post/

Objective

The goal is to install within a Linux machine a Kubernetes kubeadm installation with one master, two worker nodes and a Wordpress application deployed on the cluster. The Wordpress application should deploy by a user with role access, not the default admin user. Wordpress should be deployed via a custom Helm chart, not just YAML files.

The installation should use standard Kubernetes, not a simpler tool like MiniKube or Kind. If you have clarifying questions, reach out.

Configure a namespace, roles and kube configs to allow users to deploy, access and monitor a Wordpress Application. You want at least two user types, one to deploy the application and the other to access the Wordpress application with a port forward. Users should have the minimum role permissions required.

Deliver a 15 minute live demo and a presentation of the solution to the audience on the pluses and minuses of maintaining access to an application this way. Note these are the main objectives and we have levels that include other requirements as secondary features.

Requirements

Levels

Solutions Engineering has 4 levels which you can score on for this challenge. This helps assess the technical depth a person is bringing.

Level 1
- Deployed Wordpress Application on kubeadm Kubernetes through user access
- Custom Wordpress Helm Chart

Level 2
- Deployed Wordpress Application on kubeadm Kubernetes through user access
- Custom Wordpress Helm Chart
- Kubernetes dashboard
- Use Certificate Signing Requests to get access

Level 3
- Deployed Wordpress Application on kubeadm Kubernetes through user access
- Custom Wordpress Helm Chart
- Kubernetes dashboard
- Deployed developed application with golang api to allow retrieving information from MySQL DB on wordpress.

Level 4
- Deployed Wordpress Application on kubeadm Kubernetes through user access
- Custom Wordpress Helm Chart
- Kubernetes dashboard
- Deployed developed application with golang api to allow retrieving information from MySQL DB on wordpress.
- Ingress rules configured

Deliverables

- Provide a small design document shared with the review team with key design approaches and tradeoffs.
- Steps used to install, manage users and helm chart for Wordpress.

- The design document and deployment should allow for straightforward consumption by a technical audience. Make sure to try the deployment yourself in a clean environment to confirm a user can easily install and test it.

Kubernetes

- Install with kubeadm using containrd for container mgmt.
- Kubernetes cluster should include one master and two worker nodes.
- Use a networking tool such as Calico in the cluster.
- Deployment of Wordpress should be done by users with rights to maintain a namespace, not the default admin kubeconfig via helm.
- Deploy Wordpress on the cluster using persistent volumes for its storage (manual type is fine).
- Access the wordpress application with port-forwarding

Demo

- Present a high level overview of the solution - what is going to be demonstrated?
- Explain how the user is authenticated and their access rights with Kubernetes.
- What are the issues with this style of user management and cluster management?
- What were the choices you made for the feature you implemented for the Level you are attempting?
- Prepare a networking diagram and be ready for “deep dive” style technical questions: what is RBAC access with Kubernetes and how are users authenticated.

Important Considerations

- The guidance to use kubeadm for installing Kubernetes is the ask. **Using other wrapper methods does not meet that**.
- The helm chart should be your own and not copied from Bitnami or another source.

Guidance

Interview process

We understand that the interview is a two-sided process and we'd be happy to answer any questions!

When ready, prepare the presentation and a demo and schedule a 45 minute demo call with the interview team, present your solution to the audience and answer any questions.

In cases where the result is positive, we will continue the process to additional stakeholder interviews.

In the case of a negative review result, our hiring manager will contact you.

Project ownership

This is a test challenge and we have no intention of using the resources you've submitted in production. This is your work and you are free to do whatever you feel is reasonable to it.

Areas of focus

Teleport focuses on networking, infrastructure and security. That's why these are the areas we will be evaluating in the submission:

- Quality configurations. The configuration scripts should be high quality, easy to build and try.
- Reproducible builds. The team should be able to apply the configuration and reproduce your example easily.
- Demo. Solutions Engineers have to communicate complex technical deployments in simple terms. The demo should be interesting to watch and have a good delivery.
- Security. The Kubernetes users should have minimum access to do what's required to deploy and access the Wordpress application.

Asking questions

It is OK (and encouraged) to ask the interview team questions. Some folks stay away from asking questions to avoid appearing less experienced, so we provide examples of questions to ask and questions we expect candidates to figure out on their own.

This is a great question to ask:

> *Is it OK to pre-generate secret data and put the secrets in the repository for the purposes of POC? I will add a note that we will auto-generate secrets in the future.*

It demonstrates that you thought about this problem domain, recognize the trade off and save you and the team time by not implementing it.

This is the question we expect candidates to figure out on their own:

What version of Wordpress should I use? What docker version should I use?

We expect candidates to be able to find solutions to common non-project specific questions like this one on their own. Unless specified in the requirements, pick the solution that works best for you.

Tools

This task should be implemented with Kubernetes kubeadm 1.29+ (recommend Calico networking), kubectl on 64-bit Linux machines with a kernel version greater than 3.19.0.

Communication

When in doubt, always err on the side of over communicating - it's better to ask, we promise that we are not going to subtract any points for seemingly "silly" questions.

And THANK YOU for taking your time and taking on the challenge. We understand that your time is valuable and we really appreciate it!

We wish you good luck!