Kubernetes Tips for Better Productivity

Amber Ernst + Bill Mills

About Stone Door Group

- Mirantis Solutions Integrator that helps companies implement DevOps best practices using Docker & Kubernetes
- Docker CE to EE Accelerator Engagement
  - Complete solution for migrating applications to a secure production environment
  - Includes software licensing and consulting services needed to get Docker EE implemented
  - Migrate application workloads and ensure security/regulatory compliance
- Free 5-day trial of Docker EE available on our website

http://www.stonedoorgroup.com/docker-launcher-request

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Docker Enterprise Social Distance Learning Series

Webinar	Title	Event Date/Time	Description
1	**Get Docker Enterprise Edition Running in an Hour**	April 16, 2020 9.00 - 10.00am PST	Quickly install or upgrade to Docker Enterprise Edition
2	**Docker Tips for Better Productivity**	April 23, 2020 9.00 - 10.00am PST	Gain an edge in Docker administration
3	**Docker Tips for Better Security**	May 7, 2020 9.00 - 10.00am PST	Leverage the features of Docker Enterprise Edition for corporate security and regulatory compliance
4	**Kubernetes Tips for Better Productivity**	May 14, 2020 9.00 - 10.00am PST	Gain an edge in Kubernetes implementation

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Week #3 - Prize Winners

US Winners

Dan V.	CO	Bhaskara R.	OH
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Anderson F.	VA	Colin D.	MD

International Winners

Nic R.	Italy
Gary W.	Hong Kong
Annie G.	Brazil
David M.	Indonesia
Sergey S.	Russia

Congratulations to our prize winners from our previous event!

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Introduction

Head of Curriculum Development, Mirantis

Bill currently teaches, develops and maintains the Docker Enterprise training stack, and is based in Brooklyn, NY.

Bill Mills

Docker Accredited Instructor and Certified Associate, Stone Door Group

Amber Ernst is a Docker Certified Associate and Docker Accredited Instructor for Stone Door Group.

Amber Ernst

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A Refresher on Docker

- Scalable
- Easy to maintain
- Easier to get set up

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Autocompletion is Advantageous

You can use the autocomplete feature in Kubernetes to fill in long entries automatically. The process to achieve it is executed by some simple bash commands.

Installation:

- `apt-get install bash-completion`or `yum install bash-completion`

  - commands create main script of bash completion `/usr/share/bash-completion/bash_completion`

- Reload your shell and run `type _init_completion`

  - add the following to your `~/.bashrc` file:

    `source /usr/share/bash-completion/bash_completion`

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Enable kubectl autocompletion

You now need to ensure that the kubectl completion script gets sourced in all your shell sessions.

Two ways to do this:

- Source the completion script in your `~/.bashrc` file:
  `echo 'source <(kubectl completion bash)' >>~/.bashrc`

- Add the completion script to the `/etc/bash_completion.d` directory:
  `kubectl completion bash >/etc/bash_completion.d/kubectl`

After reloading your shell, kubectl autocompletion should be working.

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Demo:

```
$ kubectl TAB TAB
annotate autoscale convert describe expose patch rollout top
api-versions certificate cordon drain get port-forward run uncordon
apply cluster-info cp edit label proxy scale version attach
completion create exec logs replace set auth config delete explain
options rolling-update taint
```

Remember to Clean up your Environment

Clean up your Docker images to prevent the Kubelet from getting stressed

Garbage collection:

- enabled by default in the kubelet
- starts immediately when the var, lib, or Docker reaches a set capacity (90%)

 This cleanup process only begins when there isn't a flag set for the Kubelet.

Note: The lack of a default setting for an inode threshold applies to any versions before Kubernetes 1.7. This makes it essential to add a flag to the kubelet for your users on versions 1.4 - 1.6 since there are no defaults for monitoring this usage.

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Demo:

There are three different ways to delete a Kubernetes object, to do this, set the propagationPolicy on the deletion request to one of the following options:

- **Foreground:** The object itself cannot be deleted before all the objects that it owns are deleted

- **Background**: The object itself is deleted, after which the GC deletes the objects that it owned.

- **Orphan**: The object itself is deleted. The owned objects are "orphaned." by removing the reference to the owner.

Demo:

```
{
"kind": "Status",
"apiVersion": "v1",
"metadata": { },
"status": "Success",
"details": {
"name": "my-nginx",
"group": "extensions",
"kind": "deployments",
"uid": "665086e3-cdcd-11e7-83b5-080027d7dd6b"
}
}
```

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Restrict Kubectl Access

K8s are built for cluster deployment across various teams, but this doesn't mean that generic kubectl access should be given out to everyone.

Use Role-Based Access Control (RBAC) policies:

- grant different access to namespaces assigned to particular teams

This combination of read, create, and delete will be granted only to specific namespaces and can create a time-consuming process.

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Demo:

What you should make sure to prioritize in this process is granting access to secrets for your admins. This will help you to make the distinction between admin privileges for cluster and deployment.

In this scenario, our organization is using a shared Kubernetes cluster for its development and production.

- The development team- maintaining a space in the cluster to view the list of Pods, Services, and Deployments they use to build and run their application.

- The operations team- maintaining a space in the cluster where they want to enforce strict procedures on who can or cannot manipulate the set of Pods, Services, and Deployments that run the production site.

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Add Default Memory and CPU Limits

Nodes can crash, memory leaks can occur, etc.

This is why default limits are a great tool to help prevent mishaps, setting a limit ensures that connections are closed at a specified point.

Limits should be allocated per namespace.

To do this:

- Create a YAML file
- Add it to the namespace of your choice

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Demo: Configuring default memory requests & limits

- Create a namespace- this will isolate the resources you create from the rest of your cluster.

  ```
  kubectl create namespace default-mem-example
  ```

- Create a limit range and Pod

- Next, create the LimitRange in the **default-mem-example** namespace:

  ```
  kubectl apply -f
  https://k8s.io/examples/admin/resource/memory-defaults.yaml
  --namespace=default-mem-example
  ```

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Labels are Helpful

Labels are helpful in accomplishing a broad range of functions and are valuable in forming a strong foundation in Kubernetes.

- Help in loose-coupling objects to each other

- Make it easier to run queries

- Enable you to use multiple environments in one cluster

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Demo:

Examples of some labels:

```
"environment" : "dev", "environment" : "qa",
"environment" : "production"
```

Additionally, they make it easier to run queries and enables you to use multiple environments in one cluster.

An example of this (using a quality-based requirement) would look like:

```
kubectl get pods -1 environment=production, tier=frontend
```

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Try Minikube

Minikube is a flexible way to build an application and run it locally.

- Simple to download
- The instructions are straightforward

After installation of Minikube, the command to start it is simply:

```
minikube start
```

Once you've run the command, your cluster runs locally.

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Demo:

To use docker build for pushing images to the local Kubernetes cluster, you use the command:

```
eval $ (minikube docker-env)
```

It's important to note that Minikube runs on a single-node cluster inside of a Virtual Machine, so it is an ideal tool for users looking to develop with K8s on a day-to-day basis.

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Third-Party Tools Are Valuable

One of the huge advantages of Kubernetes is that it was created with modularity in mind, meaning that it can be integrated with a large number of tools and services that are provided by other vendors.

Even though these tools are not created by K8s themselves, they are recognized on their website, so it's safe to say you can trust them as much as K8s does.

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Third-party Tools

Some common ones used:

For Troubleshooting and monitoring

- Weave Scope automatically generates applications and infrastructure topologies which can help your teams identify any application performance bottlenecks easily.
  Weave Scope: Automatically Detect and Process Containers And Hosts

- Velero is a tool for overseeing disaster recovery for your Kubernetes resources and volumes. Ark provides a simple way to back up and restore your Kubernetes resources and Persistent Volumes from a series of checkpoints. These backup files are stored in an object storage service (e.g. Amazon S3).
  Velero

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Third Party Tools

For Development

- Helm is a package manager for Kubernetes which allows you to create reproducible build and manage your K8's manifests with ease.
  [Helm Docs | Helm](#)

- Kompose allows users to seamlessly transition their Docker Compose files and applications into Kubernetes objects with just one command-click. It's a great tool for developers who are experienced when it comes to container management but unfamiliar with Kubernetes.
  [Kubernetes + Compose = Kompose](#)

For Testing

- Kube-monkey is a tool that follows the principle of chaos engineering. It tests fault tolerance by randomly killing pods and can contribute to the overall health or your system. It is configured by a TOML file, so you can specify which apps you would like to kill or when to practice recovery strategies.
  [asobti/kube-monkey: An implementation of Netflix's Chaos Monkey for Kubernetes clusters](#)

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Next Steps - Try Docker Enterprise for Free

If you are new to Docker or you have setup a successful proof of concept and need some direction, Stone Door Group offers our Docker Accelerator. This comprehensive services offering enables you to transition a Docker pet project into a secure production Docker enterprise environment.

http://www.stonedoorgroup.com/docker-ce-to-ee

```
docker container run --rm -it sdgdockerlabs/coffee
```

Or reach us at: letsdothis@stonedoorgroup.com to have a chat about our experiences with migrations.

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Q & A

Download slides: bit.ly/mirantis-stone-door-webinar4

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https://kubernetes.io/docs/tasks/tools/install-kubectl/#enabling-shell-autocompletion

https://kubernetes.io/docs/concepts/workloads/controllers/garbage-collection/

https://kubernetes.io/docs/reference/access-authn-authz/rbac/

https://kubernetes.io/docs/tasks/administer-cluster/manage-resources/memory-default-namespace/

https://kubernetes.io/docs/concepts/overview/working-with-objects/common-labels/

https://kubernetes.io/docs/tasks/tools/install-minikube/