Certified Kubernetes Administrator (CKA) Exam Guide

Master the Kubernetes skills required for the hands-on CNCF CKA exam

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"Day one, not one day"

Dedicated to

In memory of ***Douglas 'Lyall' Robertson*** *1938 - 2023*

Engineer, musician, sailor, husband, father,
grandfather, and a decent man.

About the Author

Gavin Bayfield is a seasoned IT professional, having worked with clients across the UK, Australia, India and the US in a contract career spanning more than 20 years. To never stop learning is a favorite adage, evident in the 20 IT certifications accredited to Gavin by CNCF, AWS, GCP, Spring, Sun, and IBM since 2001. Gavin has a keen interest in distributed platform environments, becoming a K8s convert in 2018. An Australian based in the UK, Gavin is a family man, active hockey goalkeeper, sailor, and motorcycle enthusiast, and enjoys traveling, having visited 33 countries at the last count.

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Preface

Kubernetes is the de facto industry standard for production-grade container orchestration. The CNCF **Certified Kubernetes Administrator** (**CKA**) Certification is an in-demand, industry-recognized benchmark denoting the holder as possessing the expertise required to create, secure, manage, and troubleshoot Kubernetes clusters. CKA Certification is a key differentiator when competing to secure lucrative cloud DevOps positions or advance your role and standing within your current organization.

The CNCF CKA exam is a fully hands-on, command-line-based assessment environment. The structure of this guide follows the CKA Curriculum. The first chapter introduces the use of the Linux Foundation Training & Certification Portal, describing how to enroll and gain access to the associated hands-on CKA environment playground and CKA exam simulator sessions. The following six chapters explain need-to-know Kubernetes concepts and implementation details using hands-on code examples and command-line walkthroughs. Chapter 7, CKA Exam Preparation, provides important exam hints and tips, command-line techniques and exam strategies. Finally, the last two chapters present two CKA full-length practice exams with fully worked exam-grade solutions. This pragmatic blend of theory, worked examples, and analysis techniques aims to ensure the reader is primed to be successful in the real CKA exam.

Chapter 1: Introduction – This chapter explains the details and your working context for the CNCF Exam. Available resources and conventions are defined, notably the searchable kubernetes.io/docs and kubernetes.io/blogs websites that are accessible to candidates within the proctored assessment environment during the actual CKA exam. Instructions are provided on how to enroll using the Linux Foundation Training & Certification Portal. The associated hands-on CKA environment playground can then be accessed, and, in due course, readers are advised to tackle the available CKA exam simulator sessions.

Chapter 2: Cluster Architecture, Installation and Configuration – This chapter begins with a discussion on how authentication, authorization, and Role Based Access Controls (RBAC) are managed in Kubernetes. Working with command-line examples, the reader will be walked through a detailed explanation and demonstration of how to install, upgrade, and backup a running Kubernetes cluster. A detailed look at the backup and restore of an etcd database is also required for the exam. Further, we will examine underpinning infrastructure concerns, version and release management, and High-Availability (HA) considerations in detail.

Chapter 3: Workloads and Scheduling – This chapter explains Kubernetes deployments and demonstrates how to perform rolling updates and rollbacks using kubectl. Kubernetes ConfigMaps and Secrets are examined with examples. Next, the mechanisms for cluster scaling and self-healing containerized applications are explored in detail. The function and workings of the Kubernetes Scheduler are described, followed by worked examples illustrating the configuration and deployment of workloads using both Helm and Kustomize.

Chapter 4: Services and Networking – This chapter explores the core concepts and principles of Kubernetes networking, together with the configuration and use of Kubernetes services for messaging purposes. The nature of the connectivity between pods is explained in the context of the use of Kubernetes (virtual) services. Ingress controllers and Ingress resources are discussed and explored in a detailed walkthrough using the NGINX Ingress Controller as an example. We will examine use of DNS within a Kubernetes cluster and take a detailed look at pod network implementations using Kubernetes Container Network Interface (CNI) plugins.

Chapter 5: Storage – This chapter describes the core concepts and principles for Kubernetes storage in terms of ephemeral and persistent volumes, persistent volume claims and storage classes. The key storage characteristics required to be specified are explained in sufficient detail for the exam and demonstrated in the walkthrough section on application storage provision.

Chapter 6: Troubleshooting – This chapter is an important section in the context of the exam. Troubleshooting techniques are discussed and demonstrated, encompassing application failures, cluster component failures and Kubernetes network issues. The discussed skills and techniques are likely to be very useful to candidates both for specific troubleshooting questions in the exam and in general terms when devised exam solutions don't immediately fall into place on the first attempt.

Chapter 7 CKA Exam Preparation – This chapter explains the nature and use of the proctored exam platform and provides details on the setup of a similar CNCF Linux environment simulator. Extensive exam hints and tips are then provided, along with guidance on the CNCF CKA exam readiness checklist. A discussion on exam strategies and next steps for the exam is then provided. The author secured 94% CKA exam result, leveraging the techniques and considerations described in the section.

Chapter 8 CKA Mock Exam 1 with Solutions – This chapter provides practice exam questions at the exam-grade level of difficulty, with accompanying detailed command-line solutions, code and explanations.

Chapter 9 CKA Mock Exam 2 with Solutions – This chapter provides the second practice exam questions and fully worked solutions.

Code Bundle and Coloured Images

Please follow the link to download the
Code Bundle and the ***Coloured Images*** of the book:

https://rebrand.ly/b59ucr1

The code bundle for the book is also hosted on GitHub at
https://github.com/bpbpublications/Certified-Kubernetes-Administrator-Exam-Guide.
In case there's an update to the code, it will be updated on the existing GitHub repository.

We have code bundles from our rich catalogue of books and videos available at **https://github.com/bpbpublications**. Check them out!

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Introduction

Introduction

Welcome to your CNCF **Certified Kubernetes Administrator** (**CKA**) exam guide!

Kubernetes is the de facto industry standard for production-grade container orchestration. Demand for Kubernetes skills and hands-on experience in the IT market is currently surging worldwide. The CNCF CKA certification is an industry-recognized benchmark denoting the holder as demonstrably possessing the expertise required to create, secure, manage, and troubleshoot Kubernetes clusters. CCNF certifications provide a key differentiator to advanced IT professionals and contractors competing for lucrative devops, administrator, and architect jobs and contract engagements.

Structure

This chapter covers the following topics:

- Prerequisites
- Overview of CNCF CKA website and resources
- CNF CKA exam details
- CNCF handbook

- CNCF curriculum overview
- Registering for the CNCF CKA exam
- CNCF CKA exam simulator
- Using the CNCF CKA exam guide

Objectives

This book is intended for current and future devops, architects, administrators, and IT cloud professionals looking to rapidly gain hands-on technical insight into Kubernetes with a focus on skills, knowledge, and capabilities required by a competent professional Kubernetes administrator.

The primary objective of this book is to advance your technical understanding, hands-on practice preparations and CKA exam techniques to ensure you are successful at your first attempt at the CKA online proctored exam.

Originally developed by Google, CNCF formally adopted Kubernetes as an open-source and vendor-neutral container management system in 2016.

Prerequisites

CNCF does not mandate any specific prerequisites for this CKA exam. With readers from a variety of technical backgrounds, the start of each section in this book provides technical explanations of the core Kubernetes concepts. This approach will enable the candidate to develop a pragmatic technical knowledge base from which to assess and navigate each CKA scenario-based question and provision the required hands-on-keyboard outcomes in the exam. However, this book assumes the candidate already has awareness and basic technical competencies in the following subject areas:

- **Fundamental Kubernetes concepts**: The contemporary CKA exam version is v1.28.
- **Container runtime**: Basic understanding of a container.
- **Linux**: A working knowledge of basic Linux skills.
- **Minikube**: It would help to set up a simple minikube installation on a local device and /or access the online **KillerCoda.com** / **Killer.sh** CKA hands-on online practice sessions made available for free to all registered CNCF CKA candidates (see the following access details).
- **YAML and JSON formats**: A practical working knowledge is required to manage resource files for the extensive worked examples and walkthroughs in this book.

- **Vim editor**: The default Linux editor requires a working knowledge of the default Linux vi editor and basic commands.
- **Helm**: Basic knowledge and command line usage.

Overview of CNCF CKA website and resources

Available during every CKA exam session, a web browser is embedded in the exam **Virtual Machine** (**VM**) to allow the candidate to access only the following URL domains and resources:

- **https://kubernetes.io/docs/** (including use of page search function, noting only search results in the same permitted domain should be accessed)
- **https://kubernetes.io/blog/**

Accessible links on these domains include all language translations. For example: **https://kubernetes.io/zh-cn/docs/home.**

Note that in the CNCF CKA hands-on exam, it is highly unlikely that the candidate will have sufficient time to generally browse through this vast library of content available on the **kubernetes.io** domain. We will examine plausible exam techniques and approaches, and devise a game-plan in later section of this book. For now, it is sufficient to mention that it is strongly recommended that you, as the CKA exam candidate, become familiar with the structure of the **kubernetes.io**/docs domain. We will need to be comfortable performing spot-checks to access specific, targeted information if and as required.

Given this, in this book, beyond the explanations, examples, and walkthroughs, the read-on references will be structured in the following format to promote their access using the search function available in the top left panel on the **kubernetes.io**/docs page. Upon entering the designated search phrase, from the resultant search results, look for the indicated **kubernetes.io**/docs page title. It is nearly always the top search result link but always in the first three in the list. Ensure the search result domain is under **kubernetes.io**/docs, then click this link in the generated search results and read the related content.

Read-on Reference format in this book:

Exam friendly link (Search phrase *<type this>*): *< kubernetes.io/docs Page Title>* **https://kubernetes.io/docs/<PATH>**

Example:

Exam friendly link (Search phrase *authorization*): *Authorization Overview* **https://kubernetes.io/docs/reference/access-authn-authz/authorization/**

This book is filled with example command line code and scripts, in run-book style intended to be literally typed (by you) into your local minikube environment or online **KillerCoda.com / Killer.sh** CKA session (via your CNCF access as a registered CKA exam candidate, see section below). The aim of all these candidate hands-on exercises is to replicate and reproduce each displayed outcome as described in this section. To this end, the following nomenclature conventions have been applied.

Nomenclature

Let us take a look at the nomenclature for the book:

- Command line commands, scripts, and code are presented in a different font.
- The command line prompt representing the exam VM session is represented in this book (simply) using $. Each example command is presented in the form **`$ <command>`**. For example: **`$ kubeadm version -o json`**
- These code commands and command outputs are sometimes truncated to save space using the ellipsis character **`...`** embedded directly into the code content (providing there is no loss in semantics).
- Documentation references in the form of URLs are provided in the exam-friendly format as described in the last section.
- The **`sudo`** command is generally used to provision elevated access on the command line and is offered as a command prefix (if appropriate) in example walkthroughs in this book. However, the use of **`sudo`** is not required on cluster configurations accessed as root (and has no adverse effect).
- The terms Kubernetes and K8s are used interchangeably in this book.

CNCF CKA exam details

The CNCF CKA exam typically consists of between 16 to 18 scenario-based questions for the candidate to undertake in a single two hour (120 minute) online session. A score of 66% is the minimum mark required to pass this exam.

The displayed % weightings included with each question should aid each candidate in their assessment of which questions should be attempted and in what order, to resolve the likely path of least resistance to achieve the pass mark. Note that the percentage weightings field is no longer displayed in the real exam. A range of approaches will be presented in a later section on CKA exam techniques.

The current Kubernetes minor system version for the exam is 1.28. CNCF certification policy states that the Kubernetes version for the exam is nominally updated within 2 months of the release of the latest Kubernetes minor version.