The Only Kubernetes Starter Guide You'll Ever Need

WHAT IS KUBERNETES AND HOW CAN YOU BENEFIT FROM IT?

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Introduction

Digital transformation is no longer just hype. With the explosive growth of technologies such as smartphones, Internet of Things and augmented reality/virtual reality, organizations want to be in the forefront. They need reliable technology to speed up the development process so developers can focus on coding instead of infrastructure. This technology needs to be lightweight, portable, and easy to manage as applications scale.

One technology that meets these needs is containers. Containers have gained traction in recent years because they're easy to use, scale, and they work in various environments.

However, as companies develop and deploy hundreds of applications, managing containers can get challenging very quickly. This is where companies rely on Kubernetes. Let's understand more about it.

What Is Kubernetes?

Kubernetes is derived from a Greek word that means a pilot or helmsman. Kubernetes originally started as an open-source project within Google for the management of applications.

According to Kubernetes.io, Kubernetes is a portable, extensible, open-source platform for managing containerized workloads and services, that facilitates both declarative configuration and automation.

Containers are a good way to package application code and the required resources. For an application to run effectively and manage the resources, you need an orchestrator that maintains the desired state of the container. That is the role Kubernetes plays by providing a framework to run distributed systems resiliently.

Why Do You Need Kubernetes?

As discussed, Kubernetes helps with the orchestration of resources for a containerized environment. Let's dig deeper into why you need Kubernetes and how it helps you:

[1] **Storage Management and Orchestration**

With Kubernetes you can use storage of your choice as needed by the application. Thus, you get the flexibility of using storage from your datacenter, in public clouds, or through any other service provider.

[2] **Load Balancing**

As your applications get consumed at different levels of usage, you need to ensure that you balance the load and distribute the network traffic for it to work effectively. Kubernetes helps with this, eliminating the need for third-party tools.

[3] **Maintaining Desired State**

Kubernetes plays a vital role in maintaining the desired state of containers. It can bring back containers when they fail, replace them when required or even restart them if they are non-responsive or deviated from the desired end state.

[4] **Bin Packaging**

To run containerized applications you must define how much CPU and memory each container needs. Kubernetes helps with packaging resources to mount containers onto your nodes easily.

[5] **Maintaining Secure Information**

With Kubernetes, you can store sensitive information such as passwords, SSH keys, and authorization tokens. These are required as containers are updated, accessed, or killed. Kubernetes makes it easy to deploy and maintain secrets and application configuration as required to maintain the desired state of an application.

5 Things To Know About Kubernetes

Now that we have a basic understanding of what Kubernetes is, let's dive deeper with five key things to know about it.

[1] Kubernetes Is Not Very Widely Adopted Yet

> *Gartner states that: "By 2022, more than 75% of global organizations will be running containerized applications in production, which is a significant increase from less than 30% today."*

This stat is telling: not many global organizations have widely adopted containers and Kubernetes for their production workloads yet. Teams are still dipping their toes into a few applications that are using containers technology and Kubernetes to test the waters. This situation is further amplified as companies may not find people with the right skill sets for containers and Kubernetes development and management, which slows the pace at which Kubernetes is adopted for application development and management.

While DIY for containers is an option to keep them under your own control, companies have options available in terms of managed Kubernetes from the cloud providers (Amazon Elastic Kubernetes Service, Google Kubernetes Engine, Azure Kubernetes Service, etc). This should take away the burden of standing up a complete Kubernetes environment from scratch and maintaining it. These managed services provide an opportunity to run dev-test applications on Kubernetes and see if it's the right technology for you, or to use them for your production level workloads as your use cases are proven.

[2] Kubernetes Empowers Developers

This should not be a surprise. Kubernetes helps developers focus on coding and adding value to the business rapidly. Pre-containers, developers would have to think about how much infrastructure was available, which language should be used and whether IT operations would support initiatives in a timely manner. It would take days or weeks to solve the infrastructure puzzle.

However, with containers and Kubernetes, developers can write code and then deploy applications easily. In a true hybrid cloud, Kubernetes takes care of the rest. Infrastructure provisioning, scaling, spinning down applications and resources: all of these tasks are taken out of the complexities. That is the power of Kubernetes. No longer are developers throwing applications over to IT Ops to deploy and manage.

[3] Kubernetes supports microservices-based applications

Gartner describes microservices as a tightly-scoped, strongly-encapsulated, loosely-coupled, independently-deployable and independently-scalable application component. On a very high-level, microservices are individual services and are faster to develop and maintain when compared to a monolith application. For example, it's similar to breaking a hotel booking application into microservices such as scheduling, dining, payment and logistics services.

Breaking a monolith into microservices helps you manage, update and change these services in a more predictable fashion. If one of the microservices fails, the whole application won't go down. Managing microservices-based applications gets easier using containers because of the technical construct. Using Kubernetes to manage the container environment, in turn, simplifies the application management even further. This effectively increases productivity and helps companies build more advanced applications faster.

[4] Kubernetes thrives on decentralized IT

IT is an enabler and wants to contribute towards making any business successful. However, in the past, IT services were consumed in a fragmented and manual fashion. Developers and IT Operations have struggled to keep communication strong and these silos have delayed the application development.

However, the decentralization of IT has been more widely adopted across organizations as it speeds up the consumption of IT services and helps organizations become proactive. Therefore, developers can now consume IT through cloud providers or on-premises using catalogs. This improves agility while maintaining the needed control through guardrails established by IT.

Kubernetes thrives in a decentralized IT environment. Applications can now be deployed quickly on resources that are cost-effective. Plus, IT can monitor and control resources using simple blueprints. Kubernetes and containers further ensure that if any application goes down it can be brought back up quickly. Thus, decentralization of IT with the right guardrails has made it easy for developers to focus more on coding.

[5] Kubernetes environment can be made more secure

You're only as secure as your weakest technology. Kubernetes reduces the surface area of exposure for any breach or attack. However, you can also ensure you keep your Kubernetes environment even more secure proactively by enabling role-based access control (RBAC). RBAC makes sure the wrong person can't access things they shouldn't. It also ensures the right people and technology have access to the right layer. Do not give cluster-wide access to everyone if you want to protect your applications.

Make sure you do not expose your critical and sensitive workloads to other non-sensitive workloads. It might be even better to dedicate resources for your critical applications so that you do not have any intruders.

Don't save your security or login credentials in an open S3 bucket or in a notepad. This is common sense but worth explicitly stating since we have recently seen some massive breaches related to exposed S3 buckets. Another common practice is to keep doors locked all the time–both physically and for your IT environments. Also, set alerting mechanisms (such as policies) to monitor/identify/log as soon as a breach occurs. Harden your security postures for resources such as nodes, close all important ports, etc. Remember, security is as important as building new applications. One lapse and your company's name might flash in an online magazine.

Common Myths About Kubernetes

Kubernetes is no longer a brand new technology. Despite that, you may still come across various assumptions about Kubernetes which might be based on hearsay and not true. These myths need to be debunked to gain an unbiased, 360-degree view so companies can make the right decisions and avoid common pitfalls and misconceptions. Let's dig into these myths.

[1] KUBERNETES WILL MAKE APPLICATIONS EASY TO CODE

This is one of the most common myths about Kubernetes. "You start using containers and Kubernetes and–voila! Applications are improved. It's just as simple as that!"

Let's debunk it. Both containers and Kubernetes are designed so developers can focus on coding, instead of worrying about infrastructure. In the non-container and non-serverless world, developers need to plan for the hardware available, middleware that can be leveraged and finally languages for coding.

Containers abstract to the operating system layer thus allowing developers to easily code and things underneath can flex as needed almost automagically. This frees up developer time for more applications or business needs. More languages can also be supported using containers and Kubernetes technologies. Thus, application provisioning and management get simplified. However, developers still need to code their applications and that does not get easy with Kubernetes. They need to spend time writing and testing their code before they productionize the applications.

[2] IT IS NOT NEEDED GOING FORWARD

Here's another myth: "Through the virtualization journey, as services are abstracted further, IT will not be needed to support any applications."

This myth has grown since Kubernetes made developers more efficient. IT services are being consumed more in a decentralized way. IT is knowingly de-coupling itself from the day-to-day functions in any organization, helping organizations get more efficient and empower employees through self-service.

However, IT still stays relevant in this new era. IT will be instrumental in deciding which technology would make more sense now or years into the future. IT will also continue securing your information, data, and technology by establishing the high firewalls required. This is true even in the world of public clouds. IT needs to ensure that the right protocols are followed in case of a breach.

[3] KUBERNETES IS MORE SECURE

One thing that we all should realize by now is that nothing is 100% secure. You've no doubt heard the cloud is secure, that using containers is secure, or even banking is secure. They're only as secure as you make them. And guess what? Tomorrow there will be some new vulnerability and only until then is your environment is super-secure.

Similar is the case with Kubernetes. The way Kubernetes is designed, the surface area for exposure is minimized. You can now ensure your key resources are not exposed to the external world.

Many security breaches are caused by manual errors. Remember to develop a process to ensure everything stays secure. The approach must be the same with Kubernetes. Keep your eyes open and ears to your ground. Also, things are only secure until a vulnerability is found and exploited. Containers and Kubernetes are no exception.

[4] YOU HAVE TO MANAGE YOUR OWN KUBERNETES ENVIRONMENT

This comes up when companies, teams, or individuals begin using containers and Kubernetes space. Kubernetes was an open-source project developed in Google and then teams had to deploy and manage their own Kubernetes environments. However, that is not the case anymore.

Public cloud providers came up with their own fully-managed Kubernetes services that customers can start using from Day One. Examples include Google Kubernetes Engine (GKE), Amazon Elastic Kubernetes Service (EKS), Azure Kubernetes Service (AKS) and if you want to try a managed open-source project can be helpful.

Key Terms To Know About Kubernetes

As you spend more time learning about Kubernetes it is important to familiarize yourself with certain terms that are used more frequently.

[1]

Docker

Docker (specifically, Docker Engine) is a software technology providing operating-system-level virtualization also known as containers.

[2]

Pod

The smallest and simplest Kubernetes object. A pod represents a set of running containers on your cluster.

[3]

Node

A node is a worker machine in Kubernetes. It may be any public cloud instance or virtual machine. Services necessary to run pods are part of a node.

[4]

Kubernetes Master

Master node helps with management of Kubernetes components and containers.

[5]

Cluster

A set of worker machines, called nodes, that run containerized applications. Every cluster has at least one worker node.

[6]

Namespaces

Kubernetes also helps manage virtual clusters called Namespaces. Namespaces help when you have multiple users and you have to divide your cluster resources between them easily, similar to a folder architecture for personal computers.

[7]

Labels

Labels help you organize and select subsets of objects. They are key/value pairs attached to objects such as pods.

Manage Kubernetes Cluster Easily With CloudBolt

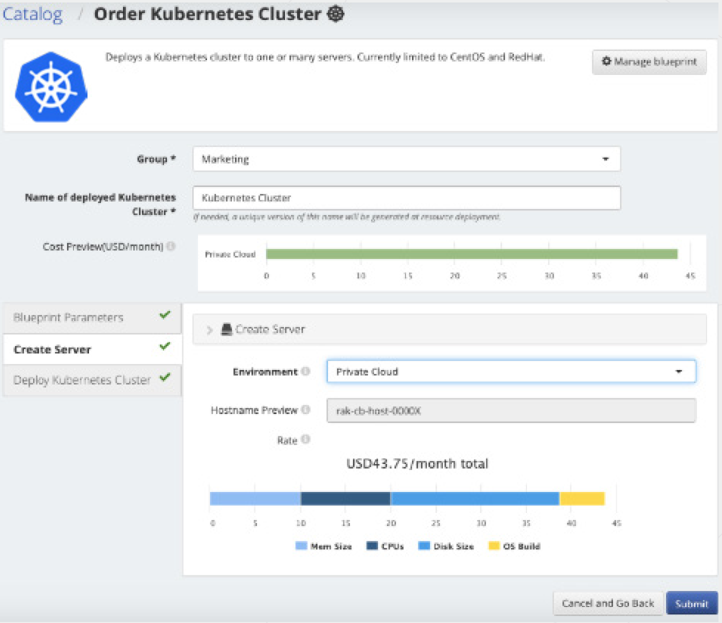
Customers leverage Kubernetes to better manage their containerized applications. However, they highlight that deploying multi-node clusters correctly is challenging. Also, provisioning containerized applications in those clusters is not easy. These activities are both time-consuming and error-prone. Additionally, not having the right tools can complicate application lifecycle management and take more time than required.

Provisioning and managing Kubernetes clusters and applications is made easy by CloudBolt's enhanced Kubernetes support. Here's how:

[1] Deploy multi-node Kubernetes clusters with confidence

Now you can deploy multi-node Kubernetes clusters for your container environments with just a few clicks. Use CloudBolt blueprints (as shown below) to define your cluster size. Then deploy those clusters in a few minutes using these blueprints.

Further, add team accountability by creating approval workflows. Add restrictions to allow cluster deployment only to certain environments (development, test, on-prem or public cloud) by default.



Deploys a Kubernetes cluster to one or many servers. Currently limited to CentOS and RedHat.

Group *: Marketing

Name of deployed Kubernetes Cluster *: Kubernetes Cluster

If needed, a unique version of this name will be generated at resource deployment.

Cost Preview(USD/month)

Environment: Private Cloud

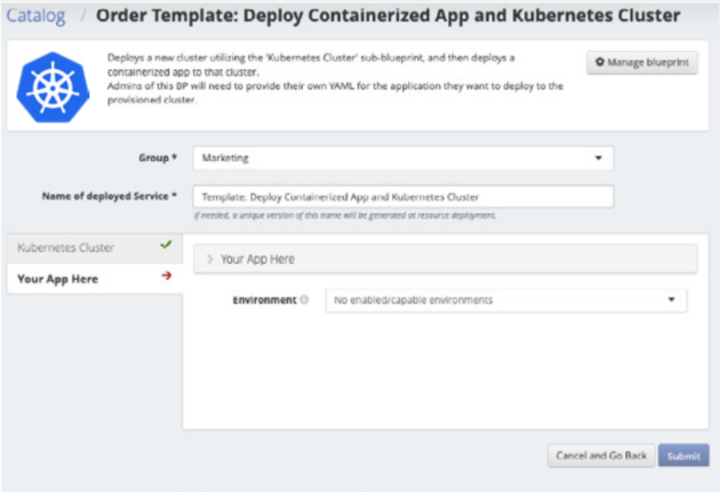
Hostname Preview: rak-cb-host-000X

Rate: USD43.75/month total

Figure 1: Deploy Kubernetes clusters easily with CloudBolt blueprints

[2] Deploy applications into targeted clusters directly

Once your clusters are ready, deploy your containerized applications in those clusters directly through CloudBolt blueprints. Also, try new versions of your multi-node applications easily using blueprints. Once testing is complete, the entire environment can be shut down with a single click or brought back up again to test new iterations through the catalog. Testing newer versions of containerized applications was never this easy.



Deploys a new cluster utilizing the 'Kubernetes Cluster' sub-blueprint, and then deploys a containerized app to that cluster.
Admins of this BP will need to provide their own YAML for the application they want to deploy to the provisioned cluster.

Group *: Marketing

Name of deployed Service *: Template: Deploy Containerized App and Kubernetes Cluster

If needed, a unique version of this name will be generated at resource deployment.

Environment: No enabled/capable environments

Figure 2: Deploy Containerized App and Kubernetes Cluster with CloudBolt

In summary, Kubernetes cluster deployment and management that used to take hours/days is now possible in just minutes. Are you deploying hundreds or even thousands of applications? You can do that easily through CloudBolt blueprints without any hassle. Plus, you can deploy container-based applications directly in the targeted clusters. This enables you to deliver value to your business faster and get back to more strategic initiatives sooner.

Conclusion

As applications become a tool for companies to compete better and gain market share, containers and Kubernetes are the vehicles helping with this transformation. As companies adopt public clouds along with their private clouds, containers and Kubernetes become that common thread across these infrastructures. Kubernetes helps developers focus on coding as opposed to managing infrastructure.

As virtual machines transformed how infrastructure was being consumed and managed by enterprises, Kubernetes now offers the next step in the orchestration journey. This journey has just begun and there are players who want to establish themselves as leaders in this space. As your organization becomes a consumer of this technology, you need to develop a bench with the right skill sets and at the same time use a platform that helps you manage your Kubernetes environment effectively and efficiently.

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About CloudBolt: Agility, Control, and Efficiency in a Hybrid Cloud World

CloudBolt is the leading cloud management platform for the enterprise. Deployed in minutes, CloudBolt helps IT provision, orchestrate, and manage their private cloud, public cloud, and hybrid cloud resources—quickly, cost-effectively, and securely—while providing developers with anywhere, anytime access to those resources through a self-service catalog.

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