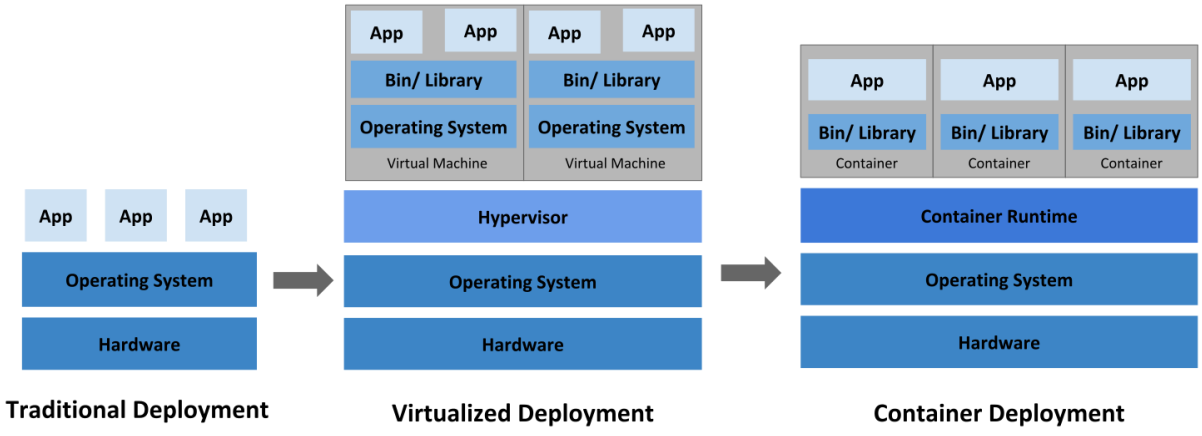
What is Kubernetes?

Kubernetes is an open-source, portable, extensible, platform for managing containerized workloads and services, that facilitates on **cloud computing** both declarative configuration and automation. It has a large, rapidly growing ecosystem. Kubernetes services, support, and tools are widely available.
The name Kubernetes originates from Greek, meaning helmsman or pilot. **Google** open-sourced the Kubernetes project in 2014. Kubernetes builds upon a [decade and a half of experience that Google has with running production workloads at scale](), combined with best-of-breed ideas and practices from the community.

Going back in time

Let's take a look at why Kubernetes is so useful by going back in time.



Traditional deployment era: Early on, organizations ran applications on physical servers. There was no way to define resource boundaries for applications in a physical server, and this caused resource allocation issues. For example, if multiple applications run on a physical server, there can be instances where one application would take up most of the resources, and as a result, the other applications would underperform. A solution for this would be to run each application on a different physical server. But this did not scale as resources were underutilized, and it was expensive for organizations to maintain many physical servers.

Virtualized deployment era: As a solution, virtualization was introduced. It allows you to run multiple Virtual Machines (VMs) on a single physical server's CPU. Virtualization allows applications to be isolated between VMs and provides a level of security as the information of one application cannot be freely accessed by another application.

Virtualization allows better utilization of resources in a physical server and allows better scalability because an application can be added or updated easily, reduces hardware costs, and much more.

Each VM is a full machine running all the components, including its own operating system, on top of the virtualized hardware.

Container deployment era: Containers are similar to VMs, but they have relaxed isolation properties to share the Operating System (OS) among the applications. Therefore, containers are considered lightweight. Similar to a VM, a container has its own filesystem, CPU, memory, process space, and more. As they are decoupled from the underlying infrastructure, they are portable across clouds and OS distributions.

Containers are becoming popular because they have many benefits. Some of the container benefits are listed below:

- Agile application creation and deployment: increased ease and efficiency of container image creation compared to VM image use.

- Continuous development, integration, and deployment: provides for reliable and frequent container image build and deployment with quick and easy rollbacks (due to image immutability).
- Dev and Ops separation of concerns: create application container images at build/release time rather than deployment time, thereby decoupling applications from infrastructure.
- Observability not only surfaces OS-level information and metrics, but also application health and other signals.
- Environmental consistency across development, testing, and production: Runs the same on a laptop as it does in the cloud.
- Cloud and OS distribution portability: Runs on Ubuntu, RHEL, CoreOS, on-prem, Google Kubernetes Engine, and anywhere else.
- Application-centric management: Raises the level of abstraction from running an OS on virtual hardware to running an application on an OS using logical resources.
- Loosely coupled, distributed, elastic, liberated micro-services: applications are broken into smaller, independent pieces and can be deployed and managed dynamically – not a monolithic stack running on one big single-purpose machine.
- Resource isolation: predictable application performance.
- Resource utilization: high efficiency and density.

Why you need Kubernetes and what can it do

Containers are a good way to bundle and run your applications. In a production environment, you need to manage the containers that run the applications and ensure that there is no downtime. For example, if a container goes down, another container needs to start. Wouldn't it be easier if this behavior was handled by a system?

That's how Kubernetes comes to the rescue! Kubernetes provides you with a framework to run distributed systems resiliently. It takes care of your scaling

requirements, failover, deployment patterns, and more. For example, Kubernetes can easily manage a canary deployment for your system.

Kubernetes provides you with:

- **Service discovery and load balancing**
  Kubernetes can expose a container using the DNS name or using their own IP address. If traffic to a container is high, Kubernetes is able to load balance and distribute the network traffic so that the deployment is stable.
- **Storage orchestration**
  Kubernetes allows you to automatically mount a storage system of your choice, such as local storages, public cloud providers, and more.
- **Automated rollouts and rollbacks**
  You can describe the desired state for your deployed containers using Kubernetes, and it can change the actual state to the desired state at a controlled rate. For example, you can automate Kubernetes to create new containers for your deployment, remove existing containers and adopt all their resources to the new container.
- **Automatic bin packing**
  Kubernetes allows you to specify how much CPU and memory (RAM) each container needs. When containers have resource requests specified, Kubernetes can make better decisions to manage the resources for containers.
- **Self-healing**
  Kubernetes restarts containers that fail, replaces containers, kills containers that don’t respond to your user-defined health check, and doesn’t advertise them to clients until they are ready to serve.
- **Secret and configuration management**
  Kubernetes lets you store and manage sensitive information, such as passwords, OAuth tokens, and ssh keys. You can deploy and update secrets and application configuration without rebuilding your container images, and without exposing secrets in your stack configuration.

SOURCE:

https://kubernetes.io/docs/concepts/overview/what-is-kubernetes/

https://opensource.com/resources/what-is-kubernetes

https://en.wikipedia.org/wiki/Kubernetes

https://kubernetes.io

https://www.infoworld.com/article/3268073/what-is-kubernetes-container-orchestration-explained.html

Note: It is all of my research about the topic. I am not a content writer, a copy is short and persuasive.