

 APPDYNAMICS

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EBOOK

How to Monitor Kubernetes with Confidence



WHAT'S INSIDE

Intro

A Brief History of Kubernetes

Chapter 1

Why Is Kubernetes So Popular?

Chapter 2

Common Challenges to Monitoring
Kubernetes and How to Avoid Them

Chapter 3

How to Deliver Flawless Application
Performance on Kubernetes

Conclusion

AppDynamics for Kubernetes

INTRODUCTION

A Brief History of Kubernetes



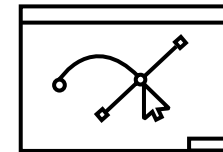
Kubernetes (K8S) is now one of the most popular platforms for managing and deploying applications built on microservices and containers.

But what exactly is Kubernetes?

Here's how InfoWorld describes it:

"An open source system for deploying, scaling, and managing containerized applications, Kubernetes handles the work of scheduling containers onto a compute cluster and manages the workloads to ensure they run as the user intended. Instead of bolting on operations as an afterthought, Kubernetes brings software development and operations together by design. By using declarative, infrastructure-agnostic constructs to describe how applications are composed, how they interact, and how they are managed, Kubernetes enables an order-of-magnitude increase in operability of modern software systems."

In short, Kubernetes gives organizations the power to manage cloud resources and containers more efficiently.



Kubernetes was originally designed and developed at Google using 15 years of research.¹

Kubernetes was initially released in June 2014, but the official launch came just over a year later when Kubernetes 1.0 made its debut at OSCon.² Today, Kubernetes is maintained by the Cloud Native Computing Foundation.

Kubernetes aims to provide a platform for automating deployment, scaling, and operations of application containers across clusters of hosts.

Kubernetes provides a container-centric management environment, orchestrating computing, networking, and storage infrastructure driven by user workloads. This provides much of the simplicity of Platform as a Service (PaaS) combined with the flexibility of Infrastructure as a Service (IaaS) and portability across infrastructure providers.

To this end, Kubernetes works with a range of container tools including Docker and can be thought of as a platform for:

- Containers
- Microservices
- Container orchestration/automation
- Cloud enablement and more

CHAPTER 1

Why Is Kubernetes So Popular?



According to a survey by the Cloud Native Computing Foundation (CNCF),

69%

of respondents said Kubernetes was their top choice for container orchestration.³



But why is Kubernetes so popular?

Well, for starters, Kubernetes delivers on the promise of doing more with less. By leveraging the portability, isolation, and immutability provided by containers and Kubernetes, development teams can ship more features faster by simplifying application packaging and deployment—all while keeping the application available without downtime. And Kubernetes' self-healing properties not only enable operations teams to ensure application reliability and hyper-scalability, they also boost efficiency through increased resource utilization.

Some additional reasons for the wide adoption of Kubernetes:



Kubernetes is the largest open source community.

The rapid proliferation of Kubernetes can also be attributed to its vibrant and highly engaged community.

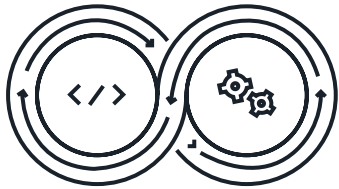
“One of the reasons Kubernetes surged past these other systems in recent months is the community and support behind the system: It’s one of the largest open source communities (more than 27,000+ stars on GitHub); has contributions from thousands of organizations (1,409 contributors); and is housed within a large, neutral open source foundation, the Cloud Native Computing Foundation (CNCF),” notes OpenSource.com.



It’s backed by top enterprise CNCF members.

Kubernetes is “front and center” within the CNCF, which has top enterprise players as members, including Google, Amazon Web Services, and Microsoft.

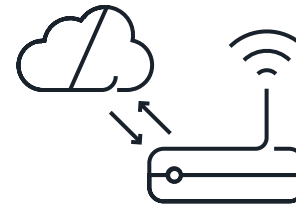
“Additionally, the ranks of enterprise members in CNCF continue to grow, with SAP and Oracle joining as Platinum members within the past couple of months. These companies joining the CNCF, where the Kubernetes project is front and center, is a testament to how much these enterprises are betting on the community to deliver a portion of their cloud strategy,” adds OpenSource.com.



It's devOps-friendly.

Another reason why Kubernetes has grown in popularity is because it supports the DevOps model of unifying dev and ops teams to speed up the process of building, testing, and releasing software.

InfoWorld explains: "Its corollary has been a shift in emphasis from managing infrastructure to managing how software is deployed and updated at scale. Most infrastructure frameworks don't support this model, but Kubernetes does, in part through Kubernetes Controllers. Thanks to controllers, it's easy to use infrastructure to manage the application lifecycle."



It delivers the benefits of the hybrid cloud.

Kubernetes can also work in any cloud. With most enterprises sharing assets between their existing on-premise data centers and the public cloud, the need for hybrid cloud technologies is critical. Kubernetes can be deployed in a company's pre-existing data center on premises, in one of the many public cloud environments, and even run as a service.

CHAPTER 2

Common Challenges When Monitoring Kubernetes and How to Avoid Them



Despite the flexibility of Kubernetes, there are operational workflow complexities, many involving application performance management, that need to be managed effectively. As enterprises expand the use of Kubernetes beyond dev/test and into production environments, these challenges become even more urgent.

The CNCF survey³ reveals that 38% of respondents identified monitoring as one of their biggest Kubernetes-adoption challenges—one that grows even larger to 46% as the size of the enterprise increases.⁴

So, what exactly should you be on the lookout for?

Shortcomings of Current Monitoring Approaches

When experimenting with Kubernetes in dev/test environments, organizations typically leverage the monitoring tools that come with Kubernetes or use those that are developed, maintained and supported by the community. Some examples include the Kubernetes dashboard, kube-state-metrics, cAdvisor or Heapster.

While these tools provide information regarding the current health of Kubernetes, they often lack data storage capabilities. As a result, InfluxDB or Prometheus (two popular time-series databases) are often added to provide persistence. For data

visualization, open-source tools such as Grafana or Kibana are tacked on. Unfortunately, even with these additions, the system still lacks log collection, so log collectors are added as well.

But even with those additions, some third-party integrations may also be needed to achieve optimum reliability. By default, monitoring data is stored on the local disk susceptible to failure due to node outages. And to secure access to their data, organizations must develop or integrate additional tools for authentication and role-based access control (RBAC).

The bottom line? Current monitoring tools simply aren't working. While this approach may work well for small development or devops teams, a production-grade solution is needed, especially as enterprises start to adopt Kubernetes for their mission-critical applications.



Lack of End-to-end Visibility

As teams move their applications onto Kubernetes, one of the most common pain points is getting end-to-end visibility into customer touchpoints and distributed applications within the Kubernetes environment and infrastructure.

In fact, many Snowflake monitoring tools such as cAdvisor, Heapster, Kube state, and Google Stackdriver fail to provide this level of visibility. As a result, teams do not have any insights into end-user experience and application performance.

The downstream effect? A lack of visibility into how application performance impacts business KPIs and in turn, no now way of knowing what to fix or improve.

The Solution:

AppDynamics for Kubernetes determines a baseline for normal application performance, and uses machine learning to intelligently rank order the problems requiring your attention.



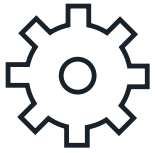
Getting Hit with Alert Storms

Operations teams responsible for quickly diagnosing application issues often risk being hit “alert storms” -- a massive influx of alerts that notify them of any issue -- big or small. For example, if you have short running bash jobs that are constantly being spun up and down, you don’t want an alert every time a job completes or a new container is spun up.

And while having visibility into all application issues is a positive thing, it can quickly become a dilemma when multiple issues arise at the same time, causing an alert storm. This is usually caused by IT teams that are unable to prioritize the alerts, and thus take too much time responding and triaging the root cause of every issue, which often results in poor user experience and lost revenue.

The Solution:

AppDynamics for Kubernetes gives the line of code, individual device, Kubernetes service, and individual container level drill-down capability to identify and troubleshoot the underlying issue.



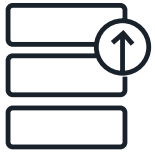
Troubleshooting Woes

Tying closely to the issue of alert storms, troubleshooting is another big factor that IT teams face when running applications on Kubernetes. That's because many of today's monitoring tools lack the ability to perform an automated root cause analysis within the Kubernetes environment.

Without the ability to drill down to the exact line of code, individual device, or container that's causing the application issue, IT teams are flying blind when trying to detect the root cause. This makes troubleshooting extremely cumbersome, often resulting in high MTTR and finger-pointing in war rooms.

The Solution:

With AppDynamics, migration of traditional applications into microservices deployed on Kubernetes is more efficient. By comparing user experiences pre- and post-migration, you get total visibility into your migration, and can easily validate its success.



Error-prone Migration to Kubernetes

Migrating traditional applications to Kubernetes, or any other cloud environment, can be error-prone and time-consuming. It's a risk that enterprises take in the hope of achieving the agility, scalability, cost benefits, innovation and business growth that the cloud offers.

Today, companies that choose to migrate existing monolithic applications to microservices lack visibility into the Kubernetes environment. This makes it impossible to see — in real-time — the interactions of every microservice or traditional application.


The Solution:

AppDynamics for Kubernetes allows IT teams to leverage their existing skill set, processes, and tooling by providing one-step install and unified monitoring within a single pane of glass.

CHAPTER 3

How to Deliver Flawless Application Performance on Kubernetes





AppDynamics for Kubernetes will give organizations the deepest visibility into application and business performance. With it, companies will have unparalleled insights into containerized applications, Kubernetes clusters, Kubernetes Events, Docker containers, and underlying infrastructure metrics—all through a single pane of glass.

To help identify container issues that may be impacting application performance, AppDynamics deploys the Standalone Machine Agent to monitor containerized applications running inside Kubernetes pods. The agent is deployed as a Kubernetes DaemonSet in every node in a Kubernetes cluster.

Not sure what a DaemonSet is?

It's a Kubernetes workload object that ensures that a particular pod runs on every node in the cluster, or on some subset of nodes. As a result, deploying the agent as a DaemonSet ensures that every Kubernetes worker node runs the Machine Agent and that the agent collects critical resource metrics from both the node host and the associated Docker containers.



Enterprises use Kubernetes to fundamentally transform how they deploy and run applications in distributed, multi-cloud environments.

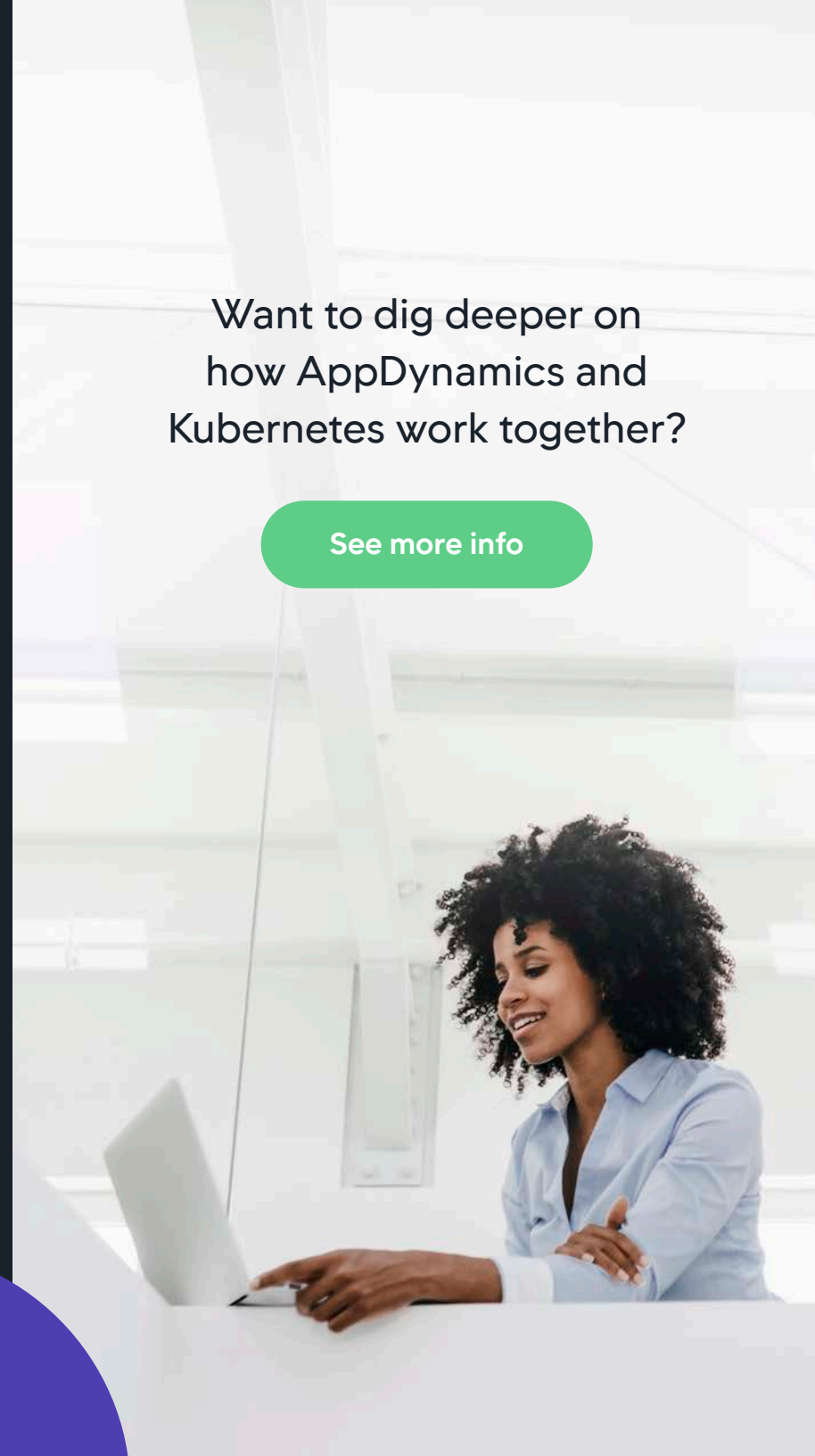
If you're one of these companies, we hope this short guide has provided some helpful advice to guide your Kubernetes journey.

AppDynamics is committed to giving enterprises end-to-end, unified visibility into their entire Kubernetes stack and Kubernetes-orchestrated applications for both on-premises and public cloud environments. We'd love to help you.

Want to see AppDynamics in action? [Schedule a Demo.](#)

Want to dig deeper on how AppDynamics and Kubernetes work together?

[See more info](#)



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