

Open source monitoring and observability stack on Kubernetes

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kubernetes

Agenda

- Introduction
- Abstract
- What is observability
- Pillars of observability
- Observability vs Monitoring
- Observability Use cases
- Observability solution with Prometheus, Grafana, Loki and Jaeger
- Demo
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Introduction

- **Aim** - Open source monitoring and observability stack on kubernetes.
- **Kubernetes** - open-source container orchestration platform.
- Designed to automate the **deployment, scaling, and management** of containerized applications.
- **Three pillars of observability - logs, metrics, and traces**
When combined, they provide sufficient insights to monitor software at any scale.
- The project covers Monitoring, Alerting/Visualization, Log Aggregation/analytics, and Distributed systems tracing infrastructure which collectively make up observability.

Abstract

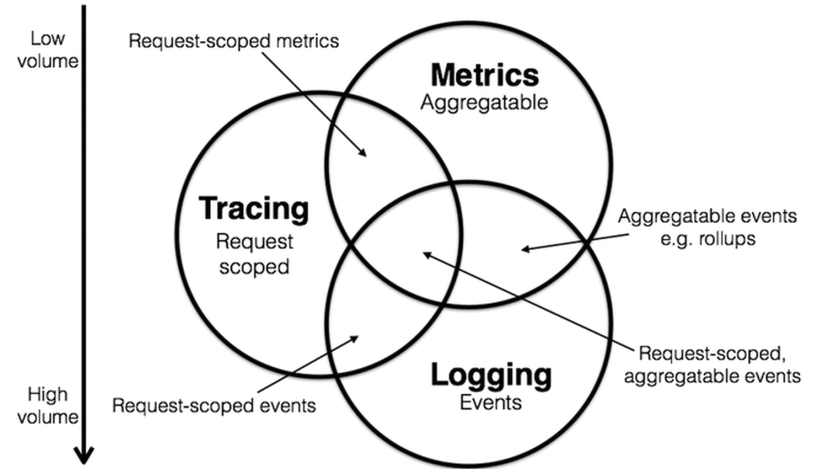
- Physical Server vs Virtual Machine vs Containers.
- Containerization and role of Kubernetes.
- Observability and Monitoring with respect to K8s.
- Setting up kubernetes tools - Micro K8s, Minikube, K3s.
- Using Grafana and Prometheus stack on the cluster to observe metrics of cluster.
- Configuring Alertmanager to receive alerts on slack channel.
- Logging and Tracing using Loki and Jaeger.

What is Observability?

- A way to get insights into the whole infrastructure.
- Can explain any questions about what is happening on the inside of the system just by observing the outside of the system.
- Helps developers understand multi-layered architectures: what's slow, what's broken, and what needs to be done to improve performance.
- Creates an insight through an actionable knowledge of the whole environment by assembling all fragments from logs, monitoring tools and organizing them.

Three Pillars Of Observability

- **Metrics:**
These are numeric representation of data measured over intervals of time.
- **Logging:**
They are discrete events and data in a structured textual form.
- **Tracing:**
Represents consecutive events which reflect an end-to-end request path in a distributed system.



Observability vs Monitoring

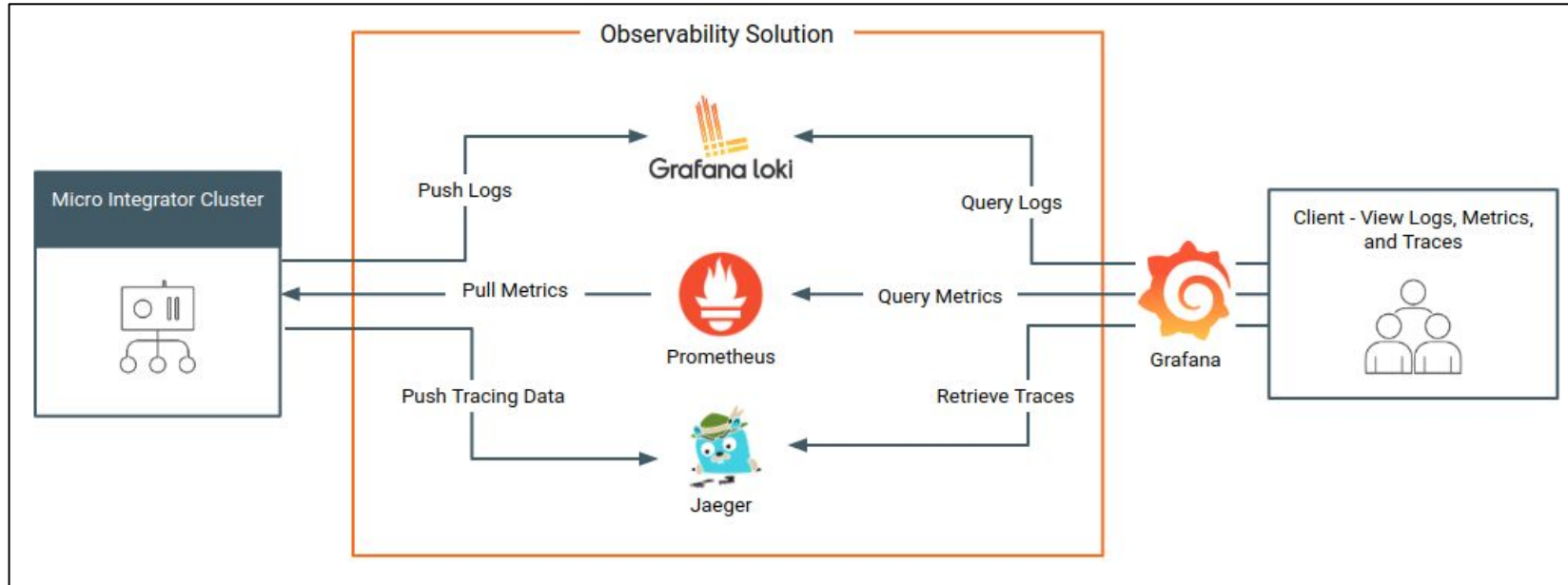
Observability	Monitoring
What is the system doing?	Is the system working?
Tells us why something goes wrong	Tells us when something went wrong
Proactive in nature	Reactive in nature
Reduces the duration and impact of incidents	Enables quick response when an incident occurs
Gain understanding actively	Consume information passively
Build to tame dynamic environments with changing complexity	Built to maintain static environments with little variation
Preferred by developers of systems with variability and unknown permutations	Used by developers of systems with little change and known permutation



Observability Use cases

- As an Infrastructure Admin, I would like the "Platform" services are monitored constantly for application runtime errors, re-curing operational / API / UI failures and generate alerts so that assigned / scheduled Support team gets notified immediately and is able to troubleshoot the error through Operations Console.
- As an Infrastructure Admin, I would like to configure Monitoring in the "Platform" to send Monitoring alerts to Operations console for any persistent failures in the System for timely response from the Operations team.
- As an SRE, I would like to monitor a gradual but consistent degradation of the Platform services performance / response times so that I can rectify any hardware resource related or scaling issues with the application and prevent missing any SLA(s).
- As an IT Operator, I would like to monitor cluster kube state and node metrics of Platform.
- As an IT Operator, I would like to monitor all the namespaces of the Platform.

Observability solution with Prometheus, Grafana, Loki and Jaeger

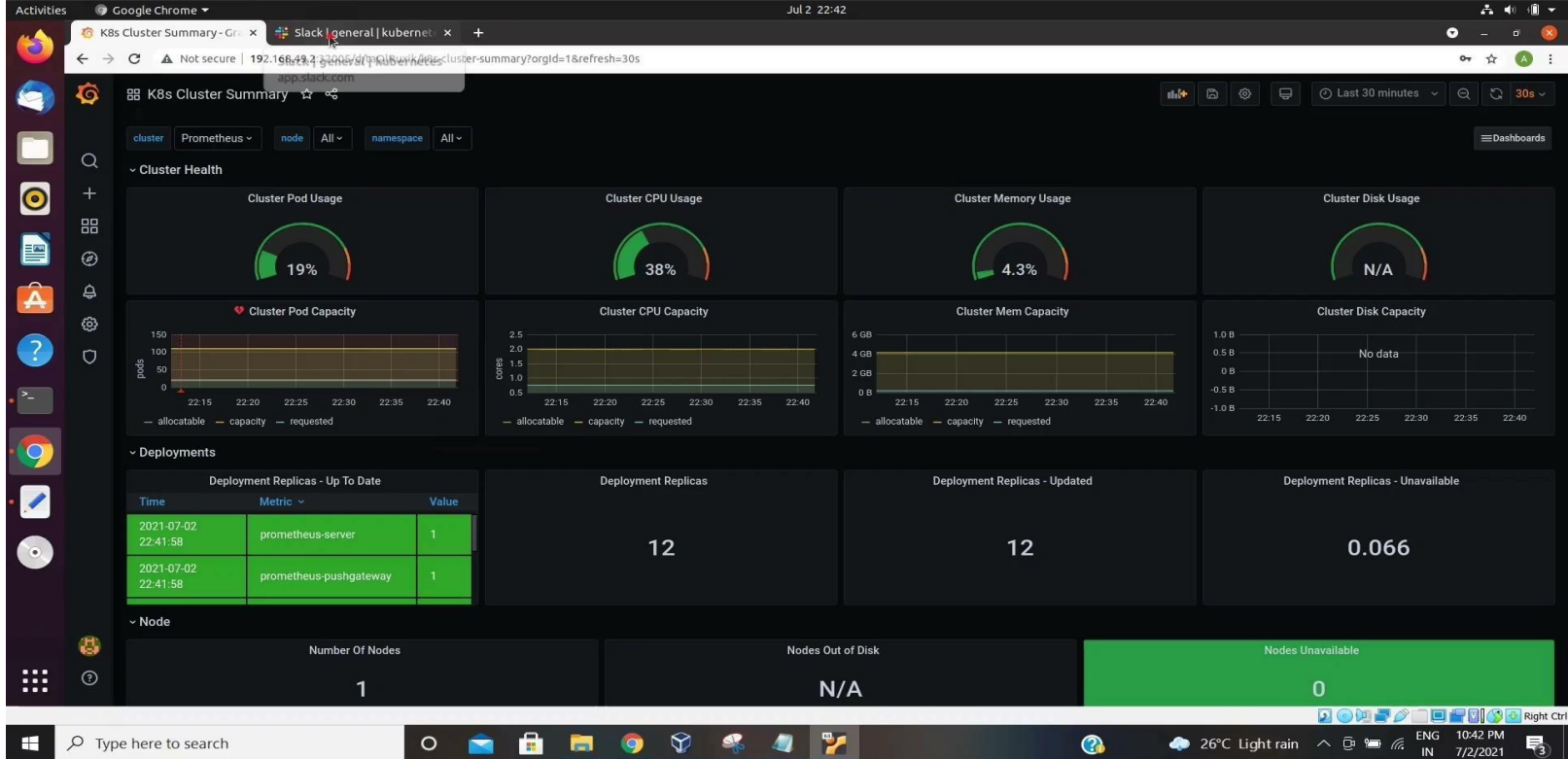


Demo

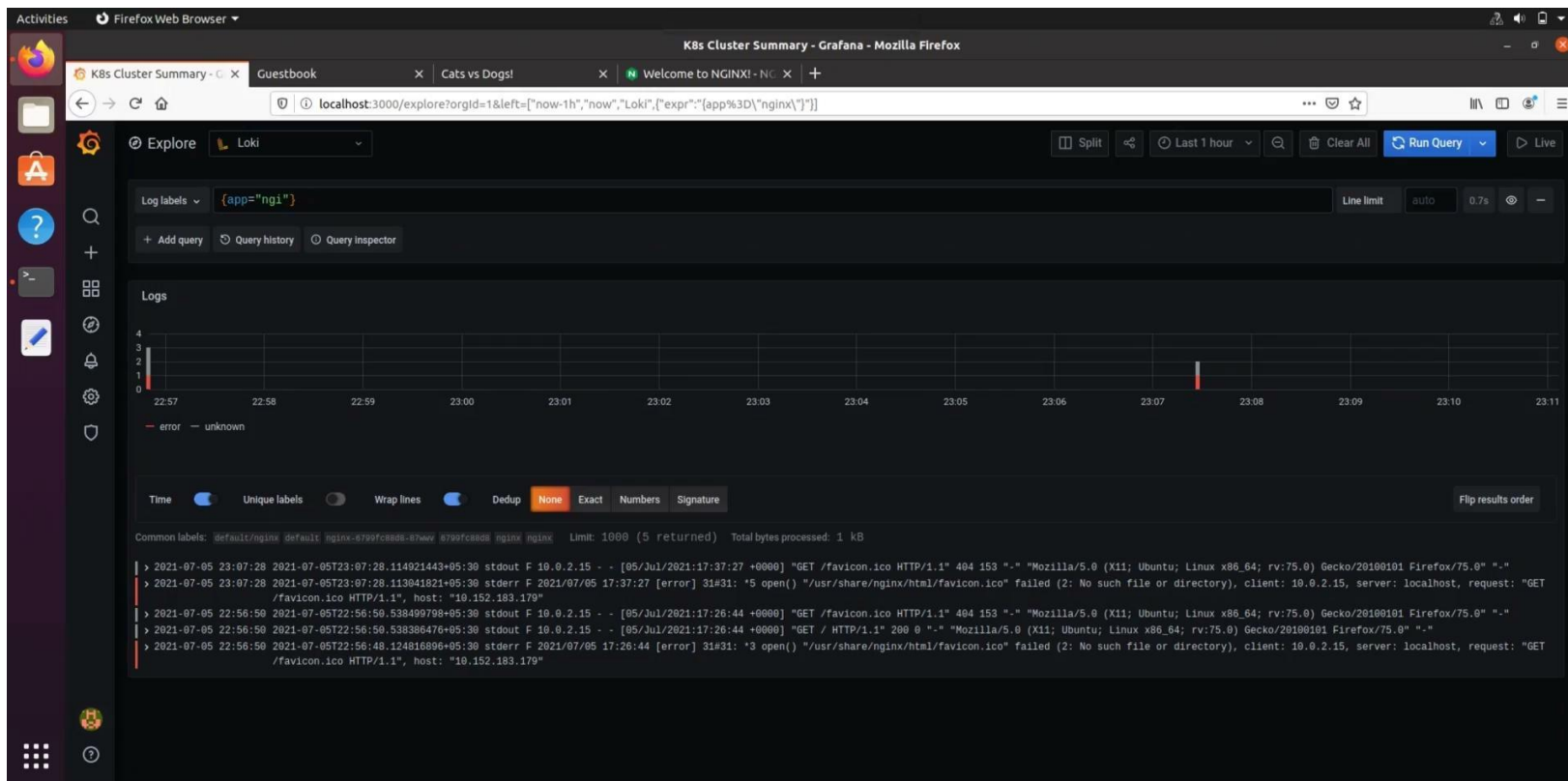


kubernetes [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help



Demo



Demo



kube1 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Firefox Web Browser Jul 7 22:14

Kubernetes Dashboard HotROD - Rides On Demand Jaeger UI Home - Grafana

127.0.0.1:8001/api/v1/namespaces/kubernetes-dashboard/services/https:kubernetes-dashboard/proxy/#/pod?namespace=default

kubernetes default Search

Workloads > Pods

Workloads

- Cron Jobs
- Daemon Sets
- Deployments
- Jobs
- Pods**
- Replica Sets
- Replication Controllers
- Stateful Sets

Service

- Ingresses
- Services

Config and Storage

- Config Maps
- Persistent Volume Claims
- Secrets
- Storage Classes

Cluster

- Cluster Role Bindings
- Cluster Roles

CPU Usage

Memory Usage

Pods

Name	Namespace	Images	Labels	Node	Status	Restarts	CPU Usage (cores)	Memory Usage (bytes)	Created
jaeger-7dd885bd4b-kppv2	default	jaegertracing/all-in-one:latest	app: jaeger pod-template-hash: 7dd885bd4b	kube1	Running	7	0.00m	12.87Mi	7 days ago
hotrod-64d95fc446-xjds9	default	jaegertracing/example-hotrod:latest	app: hotrod pod-template-hash: 64d95fc446	kube1	Running	7	0.00m	7.32Mi	7 days ago
loki-0	default	grafana/loki:2.2.0	app: loki controller-revision-hash: loki-59dfd55c0b name: loki Show all	kube1	Running	16	0.00m	24.50Mi	7 days ago
			app: promtail						



Learnings

- Importance of containerization and container orchestration.
- Importance of using Kubernetes.
- Using different tools to set up kubernetes clusters.
- Importance of observability and monitoring.
- Exploring different tools for observability and monitoring.
- Deploying multiple applications on a kubernetes cluster.
- Practical implementation of three pillars of observability i.e metrics, logging and tracing.
- Exploring multi-cluster observability.

Next steps

- Creating a central dashboard for visualizing metrics of multiple clusters.
- Using Spark to process Big Data on Kubernetes.
- Implementation of load balancers using traefik.
- Monitoring and observability using EFK Stack.
- Observability using Open Telemetry.
- Setting up a High availability cluster using K3d.
- AI/ML stack on Kubernetes.



CHALLENGES FACED

- Working remotely
- Insufficient hardware
- Ramp up time in working with various tools



Any Questions?



Thank You!