Open source monitoring and observability stack on Kubernetes

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Agenda

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- Pillars of observability
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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.

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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.

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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.

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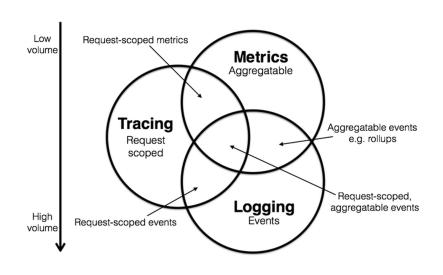# Three Pillars Of Observability

- **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.

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Observability vs Monitoring

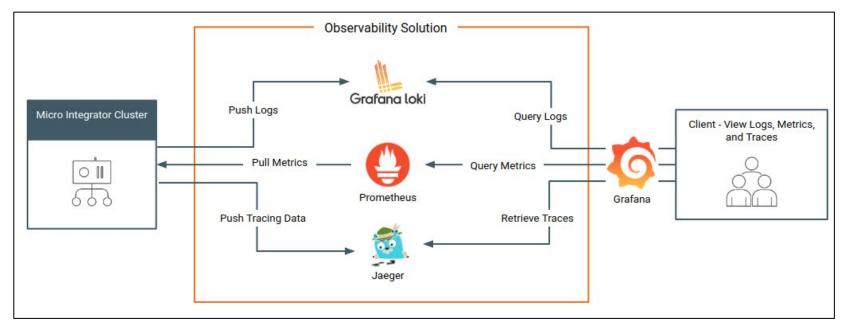| Observability	Monitoring
What is the system doing?	Is the system working?
Tells us **why** something goes wrong	Tells us **when** something went wrong
Proactive in nature	**Reactive** in nature
Reduces the duration and impact of incidents	Enables **quick response** when an incident occurs
Gain understanding **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**

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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.

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Observability solution with Prometheus, Grafana, Loki and Jaeger

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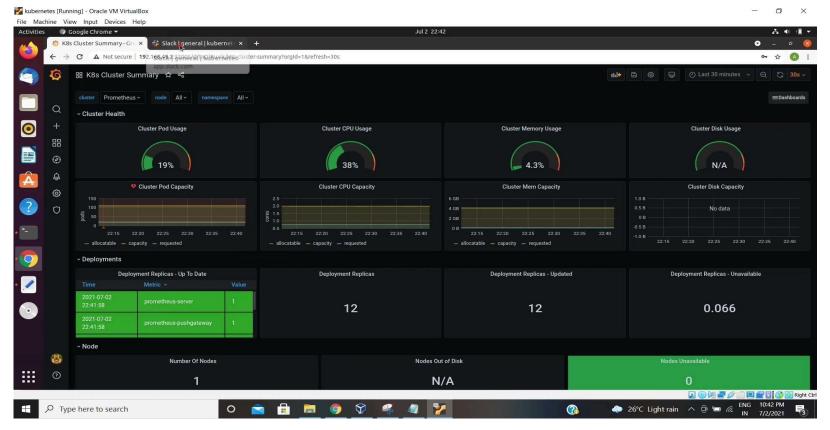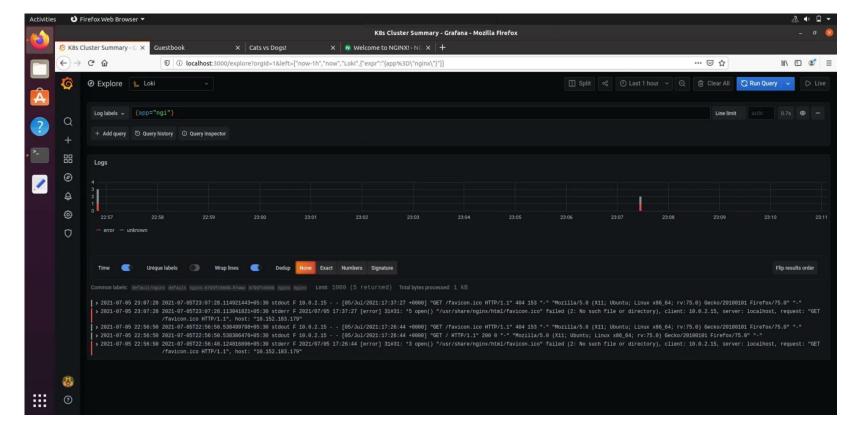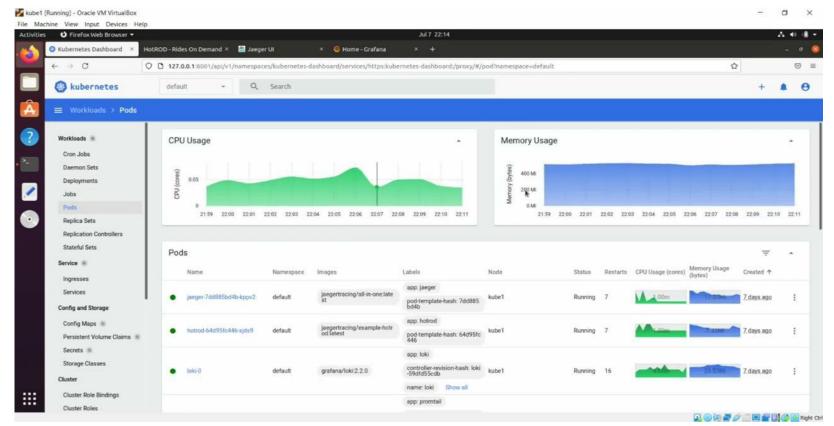
Demo

Demo

Demo

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.

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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.

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CHALLENGES FACED

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

Any Questions?

Thank You!