Container Orchestration using Kubernetes

Troubleshooting and Kubernetes

Case Studies

A Day in the Life of a DevOps Engineer

You are working as a DevOps engineer in an organization. You are responsible for designing and executing solutions to use a Kubernetes cluster, configuring hardware, peripherals, and services, and managing settings and storage. You're also responsible for troubleshooting difficulties that users have reported.

You need to decide how to troubleshoot a Kubernetes cluster, debug and examine the application.

To achieve all of the above, along with some additional features, you will be learning a few concepts in this lesson that will help find a solution for the given scenario.

Learning Objectives

By the end of this lesson, you will be able to:

- Troubleshoot a Kubernetes cluster
- Configure options in Kubernetes cluster logging architecture
- Understand cluster, node-level, and container logs in more depth
- Troubleshoot applications
- Analyze the performance of the application

TECHNOLOGY

Overview of Troubleshooting in Kubernetes

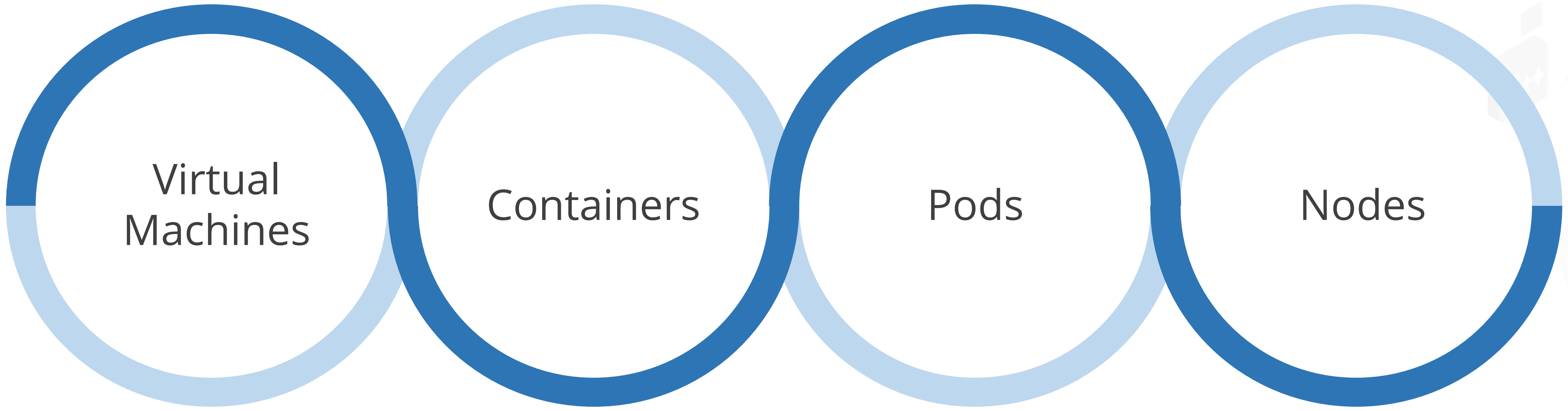
Troubleshooting

Troubleshooting in Kubernetes involves finding the root cause of a failure and taking specific steps to recover from the failure. There could be issues in any layer or component of Kubernetes.

Elements for Troubleshooting

In the Kubernetes environment, there are different elements, each of which supports debugging and troubleshooting for the administrators to analyze and understand issues.

The elements are:



List a Cluster

To debug a cluster, the first thing to do is to check whether all the nodes are registered correctly. Ensure that all the nodes are present in the **Ready** state.

Demo

```
# to check if your nodes are registered correctly

kubectl get nodes
```

Check Health of the Cluster

The health of the cluster can be checked by running the following command:

Demo

```
# to get detailed information about the health of your
cluster

kubectl cluster-info dump
```

Locations of Log Files on Master Node

A thorough investigation of issues in the cluster will require analyzing the log files in the relevant machines.

/var/log/kube-apiserver.log	The API server is responsible for serving the API.
/var/log/kube-scheduler.log	The scheduler is responsible for making scheduling decisions.
/var/log/kube-controller-manager.log	The controller manages replication controllers.

Locations of Log Files on Worker Nodes

/var/log/kubelet.log

Kubelet is responsible for running containers on the node

/var/log/kube-proxy.log

Kube proxy is responsible for service load balancing

Root Causes of Cluster Failures

Following are the root causes of cluster failure:

- Shutdown of VMs
- Network partition within the cluster or between the cluster and users
- Crashes in Kubernetes software
- Operator error
- Data loss or unavailability of persistent storage

Specific Cluster Failure Scenarios

Following are the specific cluster failure scenarios:

1. API server crashes
2. APE backing storage lost
3. Supporting services crash
4. Individual Node shutdown
5. Network Partition
6. Kubelet software fault
7. Cluster operator error

Mitigations for Cluster Failures

Following are the mitigations for cluster failures:

- Use IaaS provider's automatic VM restarting feature
- Use IaaS provider's reliable storage
- Must use high availability configuration
- Snapshot apiserver PDs or EBS volumes periodically
- Use Replication Controller and Services
- Design apps to tolerate unexpected restarts

Troubleshooting Kubernetes Cluster

Duration: 20 mins

Problem Statement:

You’ve been asked to troubleshoot and understand the problems with a Kubernetes cluster.

Assisted Practice: Guidelines

Steps to be followed:

1. Obtaining the cluster information
2. Troubleshooting using the dumps
3. Getting help on dumps
4. Getting cluster-info dump of a specific namespace
5. Getting the health status of the cluster component

TECHNOLOGY

Kubernetes Cluster Logging Architecture

Application Logs

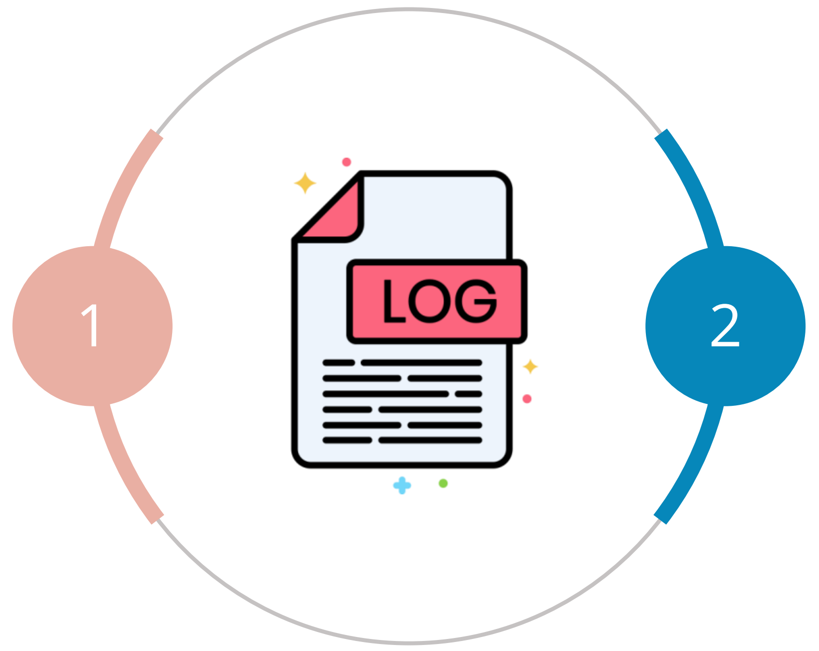
Application logs help understand the inside of an application.

Most modern applications have a logging mechanism that helps to:

- Debug problems
- Monitor cluster activity

Methods for Logging

The most commonly used logging methods for applications that use containers are:



Write to standard output stream

Write to standard error stream

Cluster-Level Logging

When logs have separate storage that is independent of containers, pods, or nodes in a cluster, it is known as cluster-level logging.

Cluster-level logging architecture:

- Enable access to application logs even if a node dies, a pod gets evicted, or a container crashes.
- Require a separate backend to store, analyze, and query logs.

Basic Logging in Kubernetes

The example shown here uses a pod specification with a container to write text to the standard output stream once every second:

Demo

```
    apiVersion: v1
    Kind: pod
    Metadata:
       name: counter
    spec:
       containers:
     - name:   count
       image:  busybox:1.28
       args : [/bin/sh, -c,
            'i=0; while true; do echo "$i: $(date)"; i=$((i+1));
sleep 1; done']
```

Basic Logging in Kubernetes

To run the pod for writing text to the standard output stream, use the following command:

Demo

```
# to write text to the standard output stream once per
second

kubectl apply -f https://k8s.io/examples/debug/counter-
pod.yaml


Output:

pod/counter created
```

Fetch Logs in Kubernetes

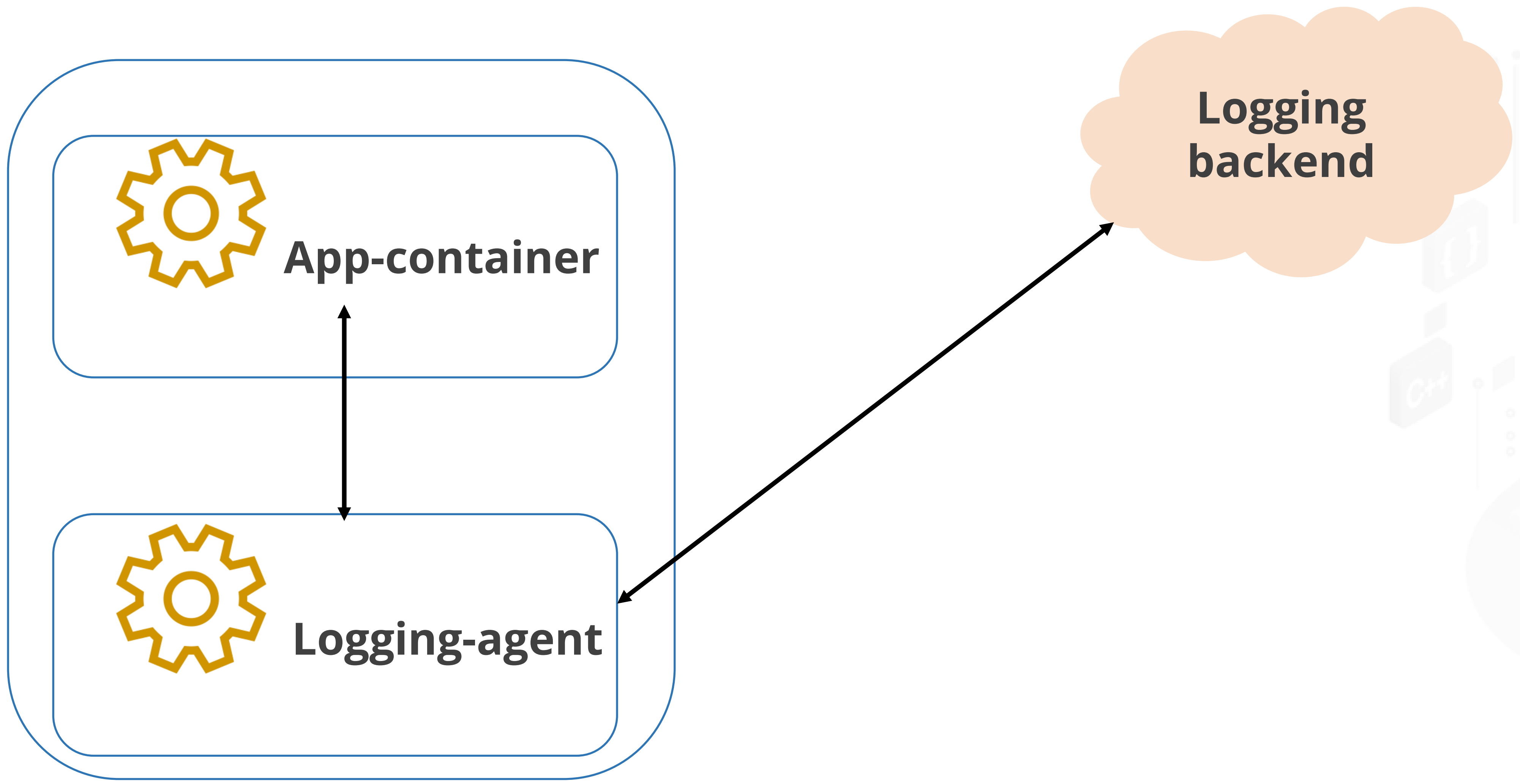
To fetch logs and retrieve them from a previous instantiation of a container, use the following commands:

Demo

```
# command to fetch the logs

kubectl logs counter

Output:

0: Mon Feb  7 00:00:00 UTC 2001
1: Mon Feb  7 00:00:01 UTC 2001
2: Mon Feb  7 00:00:02 UTC 2001
...

# command to retrieve logs from a previous instantiation
of a container use

kubectl logs --previous
```

Sidecar Container with a Logging Agent

A sidecar container with a separate logging agent can be configured to run with the application if the node-level logging agent is not flexible.



Configuration Files to Implement Sidecar Container

Here is a configuration file to implement a sidecar container with a logging agent:

Demo

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: fluentd-config
data:
  fluentd.conf: |
    <source>
      type tail
      format none
      path /var/log/1.log
      pos_file /var/log/1.log.pos
      tag count.format1
    </source>
```

Demo

```
<source>
      type tail
      format none
      path /var/log/2.log
      pos_file /var/log/2.log.pos
      tag count.format2
</source>

    <match **>
      type google_cloud
```

Configuration Files to Implement Sidecar Container

The second configuration file describes a pod that has a sidecar container running **fluentd**.

Demo

```
apiVersion: v1
kind: Pod
metadata:
  name: counter
spec:
  containers:
  - name: count
    image: busybox:1.28
    args:
    - /bin/sh
    - -c
    - >
i=0;
          while true;
      do
        echo "$i: $(date)" >> /var/log/1.log;
        echo "$(date) INFO $i" >>
/var/log/2.log;
        i=$((i+1));
        sleep 1;
      done
```

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Configuration Files to Implement Sidecar Container

Fluentd can be replaced with any logging agent.

Demo

```
VolumeMounts:
    - name: varlog
      mountPath: /var/log
  - name: count-agent
    image: k8s.gcr.io/fluentd-gcp:1.30
    env:
    - name: FLUENTD_ARGS
      value: -c /etc/fluentd-config/fluentd.conf

volumeMounts:
    - name: varlog
      mountPath: /var/log
    - name: config-volume
      mountPath: /etc/fluentd-config
  volumes:
  - name: varlog
    emptyDir: {}
  - name: config-volume
    configMap:
      name: fluentd-config
```

Understanding Kubernetes Cluster Logging Architecture

Duration: 15 mins

Problem Statement:

You've been assigned the task of understanding the logging architecture of the Kubernetes cluster.

Assisted Practice: Guidelines

Steps to be followed:

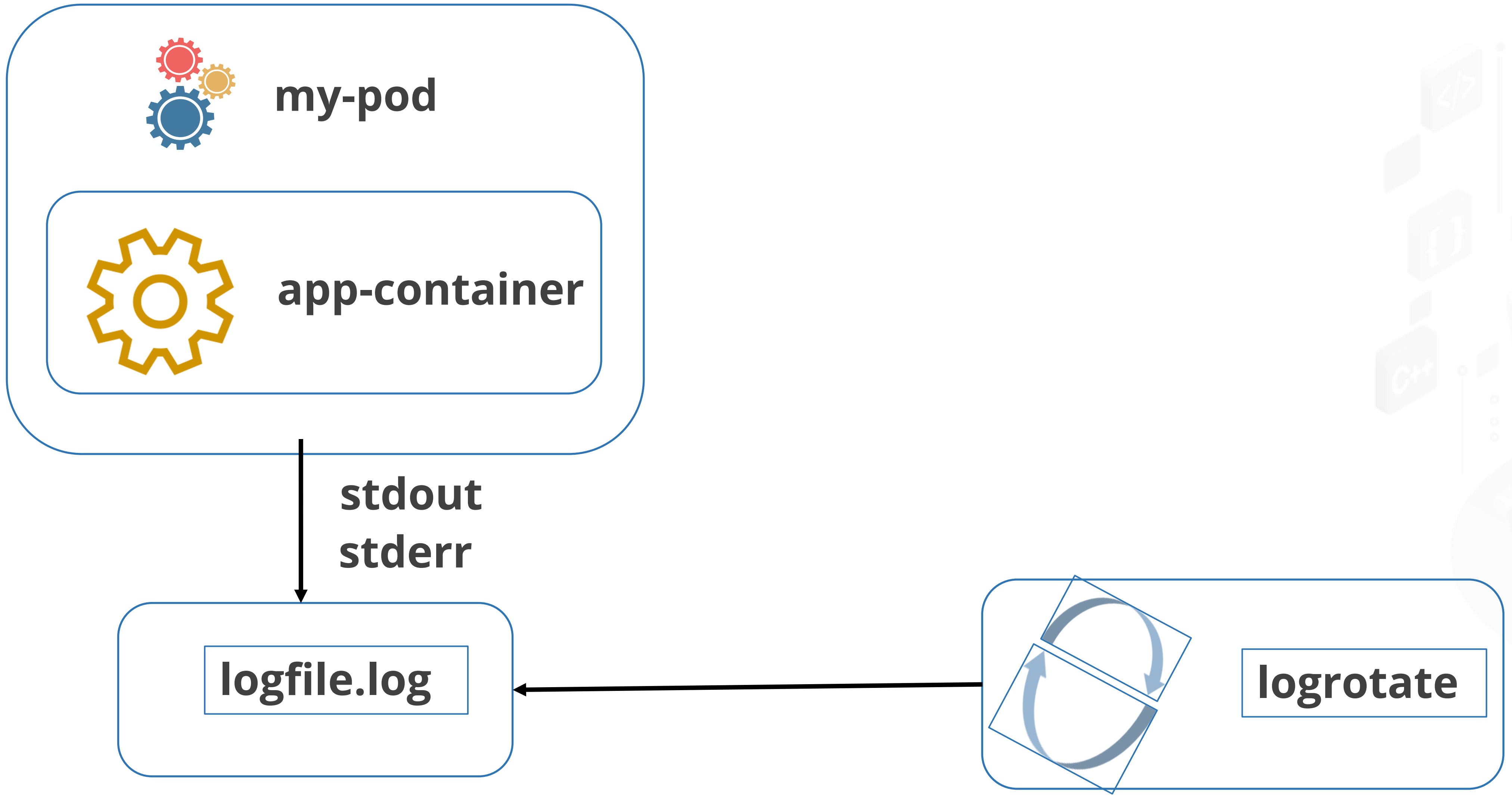
1. Getting help on logging
2. Experimenting with BusyBox
3. Logging Pod information
4. Logging options and switching information

TECHNOLOGY

Cluster and Node Logs

Node-Level Logging

A container engine manages and redirects any output to the application's **stdout** and **stderr** streams. A deployment tool must be set up to implement log rotation.



CRI Container Runtime

The kubelet is responsible for managing the logging directory structure and rotating the logs while using a CRI container runtime.

There are two kubelet flags that can be used:

- Container-log-max-size to set the maximum size for each log file
- Container-log-max-files to set the maximum number of files allowed for each container

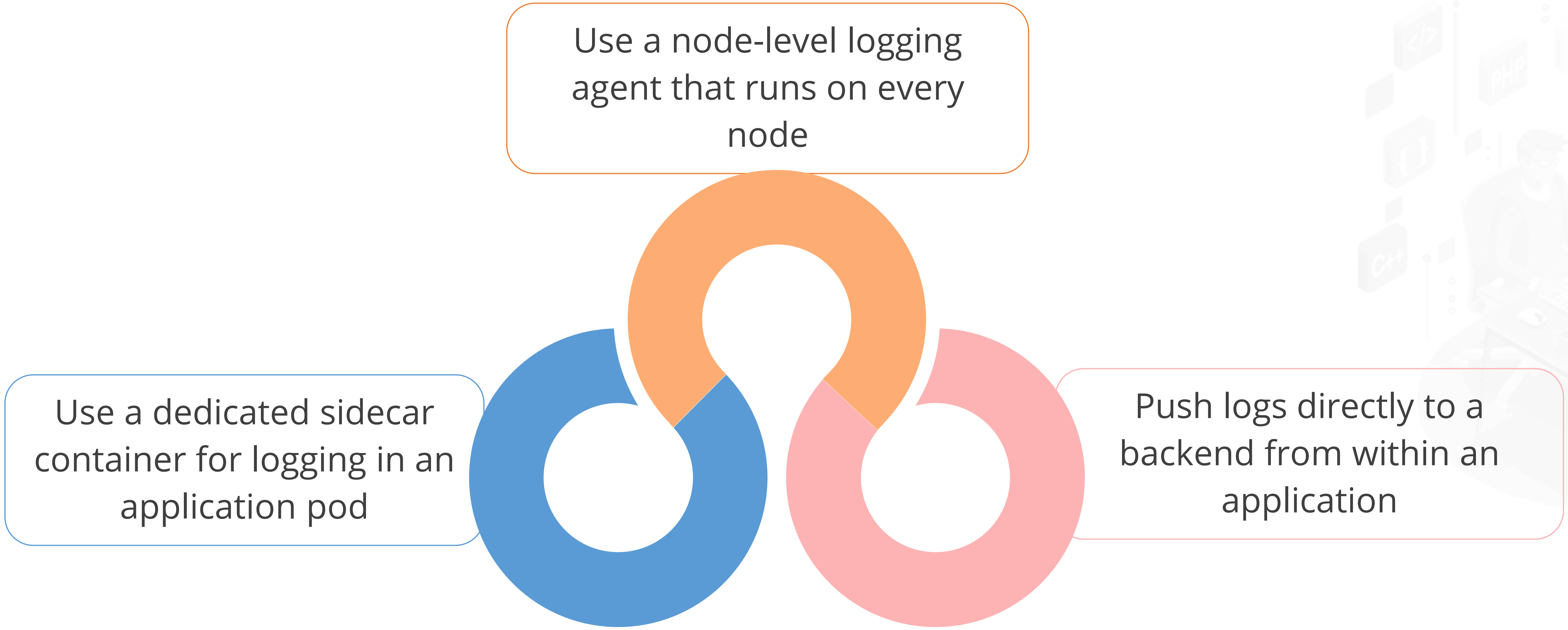
System Component Logs

There are two types of system components:

Those that run a container	Those that do not run a container
Example: Kubernetes Scheduler and kube-proxy	Example: Kubelet and Container runtime

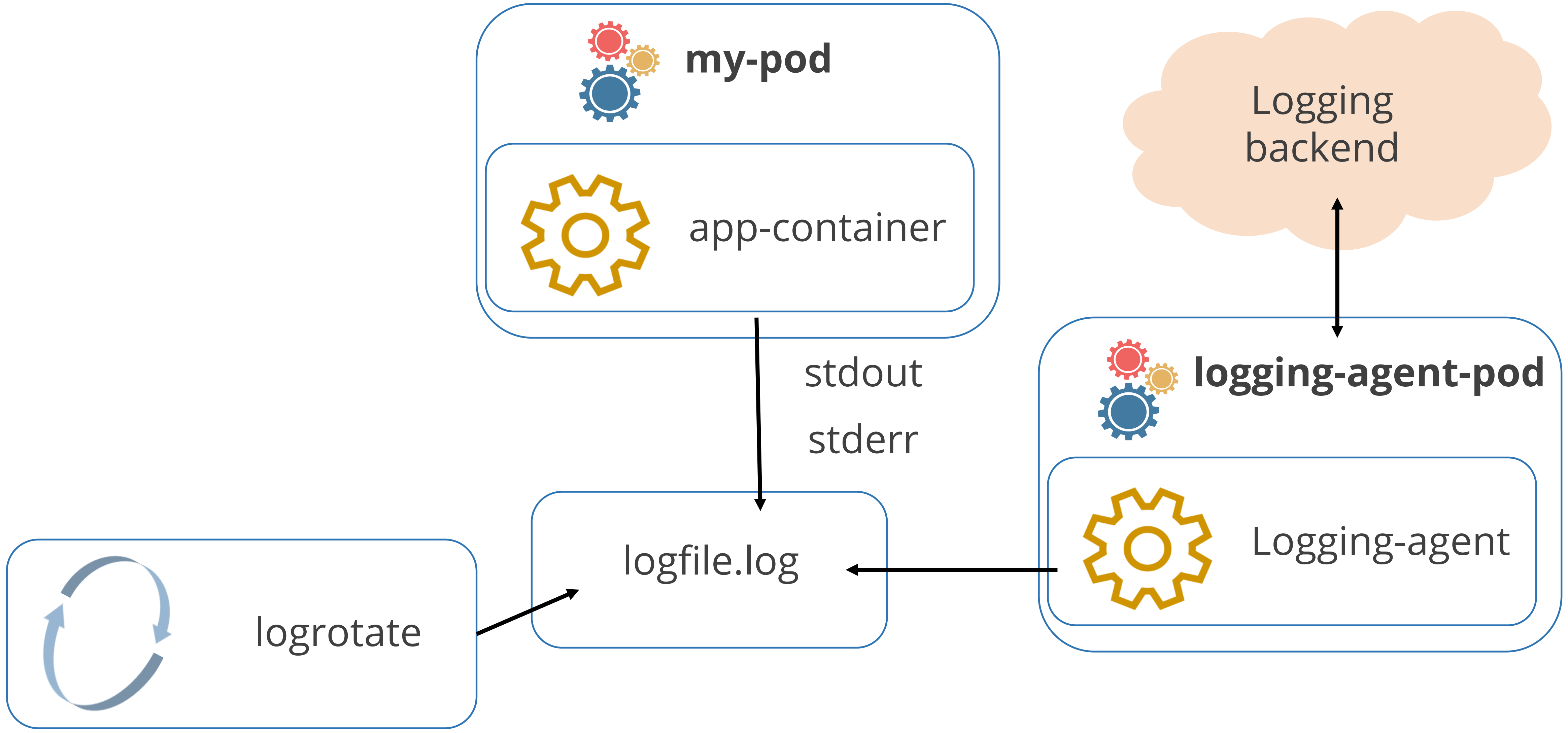
Methods of Cluster-Level Logging

Let us examine some methods that can be considered for cluster-level logging:


Use a node-level logging agent that runs on every node
Use a dedicated sidecar container for logging in an application pod
Push logs directly to a backend from within an application

Usage of Node Logging Agent

Cluster-level logging may be implemented by including a node-level logging agent on each node. A logging agent is a tool that pushes logs to a backend.



Usage of Sidecar Container

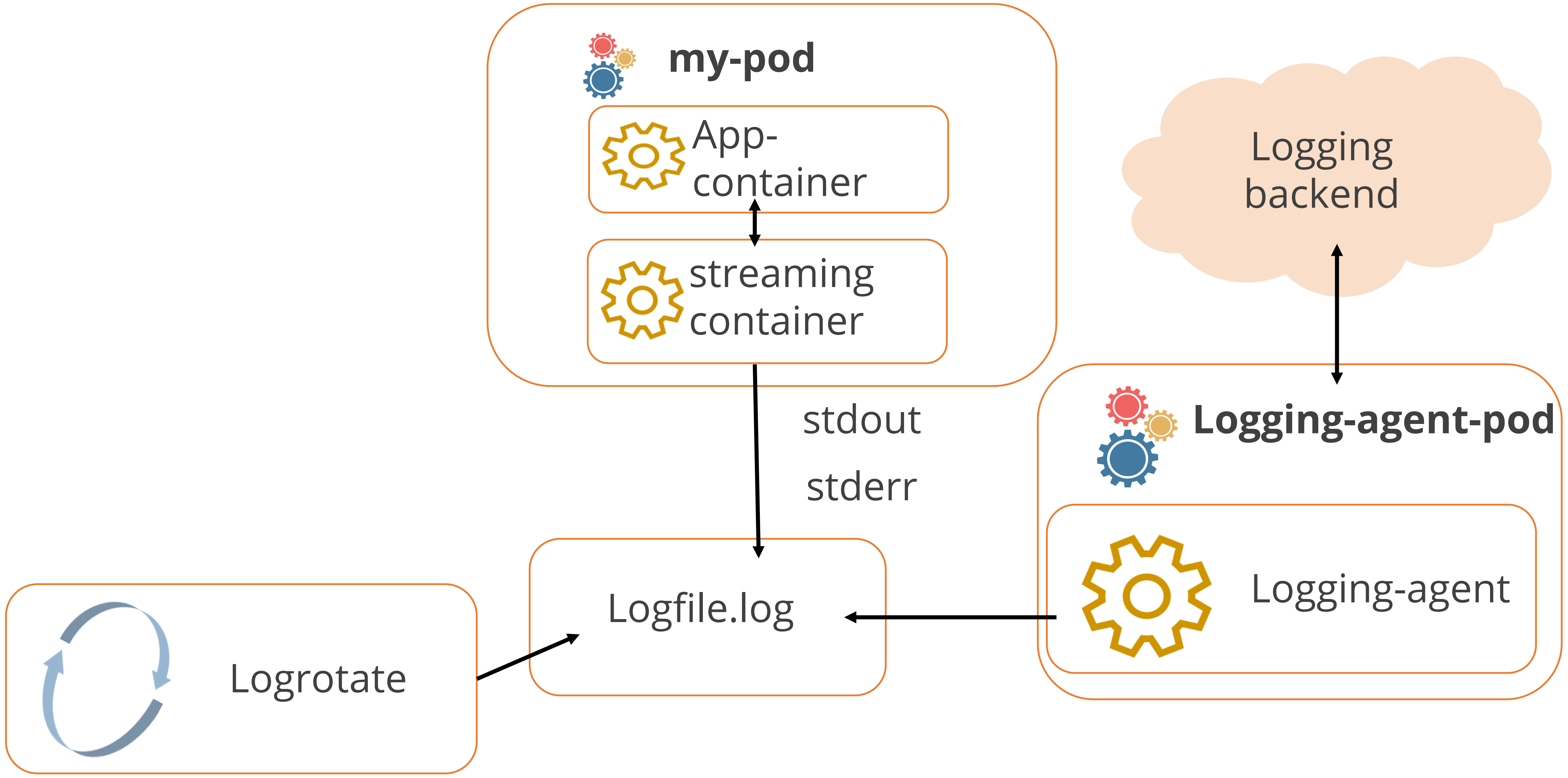
A sidecar container can be used for cluster-level logging in either of the following ways:

Stream application logs to its own stdout

Run a logging agent that is configured to pick up logs from an application container

Usage of Sidecar Container with a Logging Agent

A sidecar container prints logs to its own **stdout** or **stderr** stream.



Pod with a Single Container

Here's a configuration file for a Pod with a single container:

Demo

```
apiVersion: v1
kind: Pod
metadata:
  name: counter
spec:
  containers:
  - name: count
    image: busybox:1.28
    args:
    - /bin/sh
    - -c
    - >
i=0;
   while true;
   do
      echo "$i: $(date)" >> /var/log/1.log;
      echo "$(date) INFO $i" >> /var/log/2.log;
      i=$((i+1));
      sleep 1;
   done
```

Pod with a Single Container

Here's a configuration file for a Pod with a single container:

Demo

```
volumeMounts:
    - name: varlog
      mountPath: /var/log
  volumes:
  - name: varlog
    emptyDir: {}
```

Pod with Two Sidecar Containers

Here's a configuration file for a Pod that has two sidecar containers:

Demo

```
apiVersion: v1
kind: Pod
metadata:
  name: counter
spec:
  Containers:
  - name: count
    image: busybox:1.28
    args:
    - /bin/sh
    - -c
    - >
i=0;
   while true;
   do
      echo "$i: $(date)" >> /var/log/1.log;
      echo "$(date) INFO $i" >> /var/log/2.log;
      i=$((i+1));
      sleep 1;
   done
```

Pod with Two Sidecar Containers

Demo

```
volumeMounts:
    - name: varlog
      mountPath: /var/log
  - name: count-log-1
    image: busybox:1.28
    args: [/bin/sh, -c, 'tail -n+1 -f /var/log/1.log’]
volumeMounts:
    - name: varlog
      mountPath: /var/log
  - name: count-log-2
    image: busybox:1.28
    args: [/bin/sh, -c, 'tail -n+1 -f /var/log/2.log']
    volumeMounts:
    - name: varlog
      mountPath: /var/log
  volumes:
  - name: varlog
    emptyDir: {}
```

Access Log Streams

When you run the Pod, each log stream can be accessed separately by running the following command:

Demo

```
# to access each log stream separately use this command:

kubectl logs counter count-log-1

Output:

0: Mon Feb  7 00:00:00 UTC 2001
1: Mon Feb  7 00:00:01 UTC 2001
2: Mon Feb  7 00:00:02 UTC 2001
...

kubectl logs counter count-log-2

Output:

Mon Jan  1 00:00:00 UTC 2001 INFO 0
Mon Jan  1 00:00:01 UTC 2001 INFO 1
Mon Jan  1 00:00:02 UTC 2001 INFO 2
```

Understanding Cluster and Node Logs

Duration: 10 mins

Problem Statement:

You’ve been assigned a task to understand cluster and node logs.

Assisted Practice: Guidelines

Steps to be followed:

1. Getting started with worker-node1.example.com
2. Experimenting with kubelet

Node Not Ready

Duration: 15 mins

Problem Statement:

You have been asked to configure a node with the status **NotReady** to **Ready**.

Assisted Practice: Guidelines

Steps to be followed:

1. Checking the node status on the master node
2. Navigating to worker-node2
3. Stopping the Docker service and checking the kubelet status
4. Navigating to the master node and checking the node status
5. Restarting the Docker service on worker-node2
6. Verifying the node status on the master node

Container Logs

Fetch Container Logs

Problems in a cluster can happen at the container level. Kubectl provides the following command to fetch the logs.

```
kubectl logs counter
```

If there are many containers in a single Pod, the names of the containers should be specified in the command.

Commands to Fetch Container Logs

The logs of a container can be fetched using any of the following options:

kubectl logs nginx	To get the snapshot logs from Pod nginx with only one container.
kubectl logs –p –c ruby web-1	To get a snapshot of ruby container logs that were terminated earlier.
kubectl logs –f –c ruby web-1	To start streaming the logs of the ruby container in a Pod called web-1.

Commands to Fetch Container Logs

kubectl logs --tail=20 nginx

To show the most recent 20 lines of output in pod nginx

kubectl logs –since=1h nginx

To display all the logs from the pod nginx written in the last one hour

Fetch Docker Container Logs

The Docker logs command retrieves logs present at the time of executing the command.

```
$ docker logs [OPTIONS] CONTAINER
```

Docker Container Command Options

Name	Description
--details	Show extra details provided to logs
--follow, --f	Follow log output
--since	Display logs since timestamp 20%
--tail –n	Number of lines to show from the end of the logs
--until	Show logs before a timestamp

Understanding Container Logs

Duration: 15 mins

Problem Statement:

You’ve been assigned a task to understand cluster logging architecture.

Assisted Practice: Guidelines

Steps to be followed:

1. Logging docker container
2. Logging Kubernetes container

Pod Logs

Duration: 10 mins

Problem Statement:

You've been assigned a task to create and check Pod logs.

Assisted Practice: Guidelines

Steps to be followed:

1. Create Nginx Deployment and verify Deployment and Pods by using the mentioned command
2. Creating a Deployment for Nginx using ta mentioned command
3. Verifying Deployments and Pods
4. Checking the logs of the Nginx Pod

Events

Duration: 15 mins

Problem Statement:

You’ve been assigned a task to create Nginx Deployment and check events.

Assisted Practice: Guidelines

Steps to be followed:

1. Create Nginx Deployment
2. Create a Deployment for Nginx
3. Verify Deployments and Pods
4. Check all events
5. Check events of Nginx

TECHNOLOGY

Application Troubleshooting

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Diagnose Problem

The first step in diagnosing a problem in the application is to identify where the problem is located. It could be in any of the following components:

- Pods
- Services
- Replication Controller

Debug Pods

The first step in debugging a Pod is to check its current state and recent events with the following command:

Demo

```
# to check the current state of the Pod and recent events

kubectl describe pods ${POD_NAME}
```

Pods in Pending State

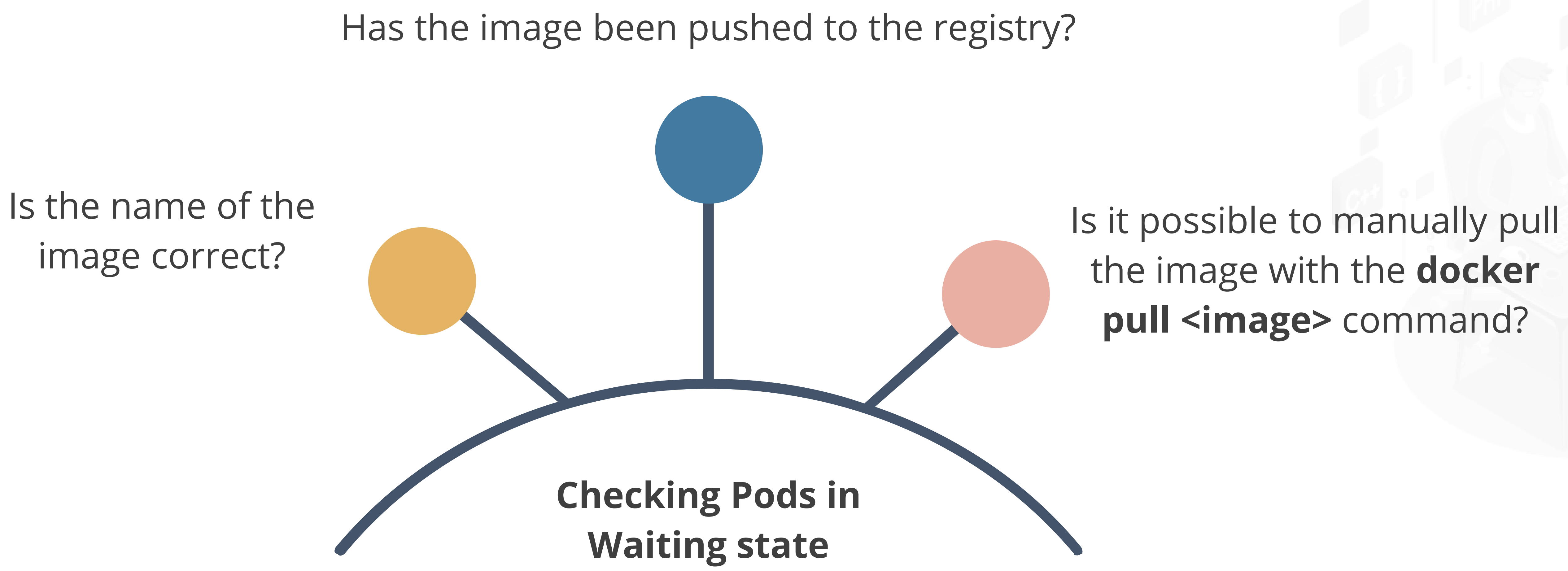
If a Pod gets stuck in a pending state, it means that it cannot be scheduled into a node. There could be two reasons for this:

1. There are not enough resources- the supply of CPU and memory in the cluster is depleted.

2. If the Pod is bound to a hostPort- in this case, there are only a few places where the Pod can be scheduled.

Pods in Waiting State

Failure to pull the image is one of the most common causes of waiting pods. In such a scenario, there are three things that need to be checked:


Has the image been pushed to the registry?
Is the name of the image correct?
Is it possible to manually pull the image with the **docker pull <image>** command?
Checking Pods in Waiting state

Pods Not Behaving as Expected

If the Pod is not behaving as expected, there could be two reasons:

An error in the Pod description was ignored during Pod creation.

A section of the Pod description is nested incorrectly or a keyname is typed incorrectly.

Debug Services

Services perform the function of providing load balancing across a set of pods. Service problems could be debugged in the following ways:

- Check whether endpoints are available for the service.
- Ensure that endpoints match the number of pods that are expected to be members of the service.
- List Pods using labels that the service uses.

Command for Debugging Services

The endpoints should match the number of pods. To check whether endpoints are available for the service, use the following command:

Demo

```
# command to view the endpoints

kubectl get endpoints
```

Understanding Application Troubleshooting

Duration: 10 mins

Problem Statement:

You've been asked to troubleshoot applications in the cluster.

Assisted Practice: Guidelines

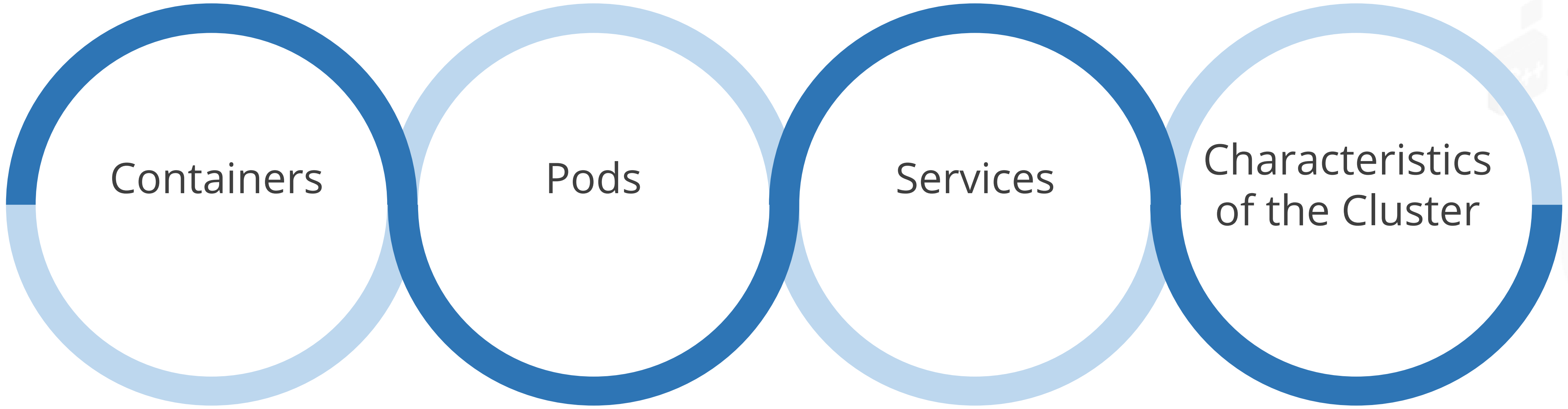
Steps to be followed:

1. Troubleshooting application

Monitoring Tools

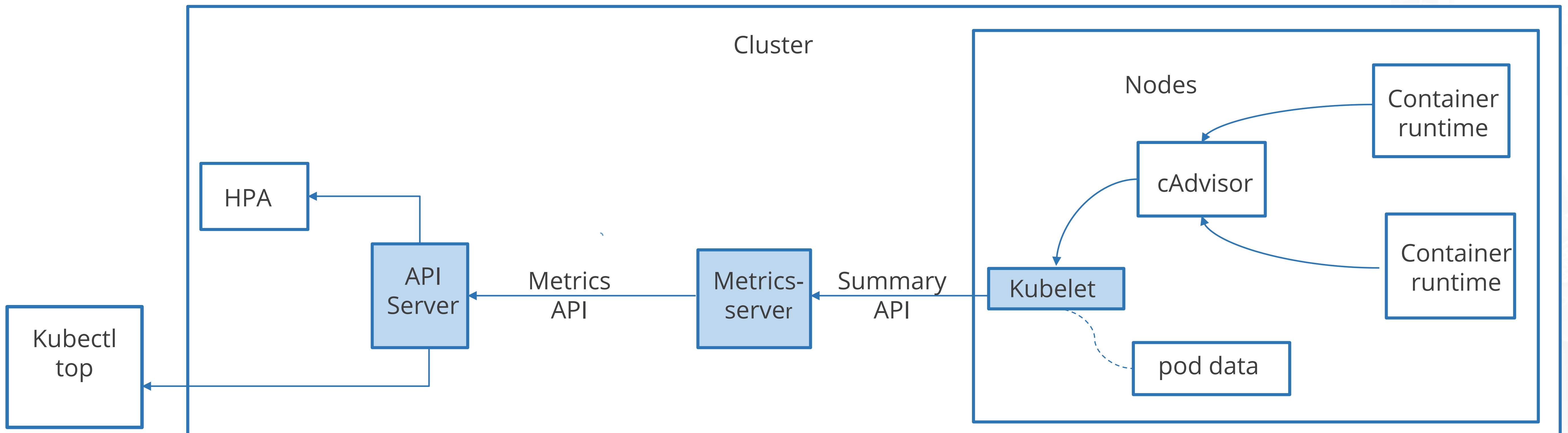
Elements for Monitoring Resources

Kubernetes gives detailed information about the resource usage of an application. Check the performance of the application in a Kubernetes cluster by examining the following:



Architecture of Resource Metrics Pipeline

The metrics API for Kubernetes provides a basic set of metrics to support automatic scaling and related use cases.



Architecture of Resource Metrics Pipeline

From right to left in the figure, the architecture components are as follows:

cAdvisor

Kubelet includes a daemon for collecting, aggregating, and exposing container metrics.

kubelet

Node agent for container resource management. The /metrics/resource and /stats kubelet API endpoints provide access to resource metrics.

Summary API

The kubelet provides an API for discovering and retrieving per-node summarized stats via the /stats endpoint.

Architecture of Resource Metrics Pipeline

Metrics-server

A cluster add-on component that collects and aggregates resource metrics from each kubelet. The metrics API is served by the API server for use by HPA, VPA, and the kubectl top command. Metrics server is a metrics API reference implementation.

Metrics API

Access to CPU and memory for workload autoscaling is supported by the kubernetes API. You'll need an API extension server that supports the metrics API to make this work in your cluster.

Resource Metrics Pipeline

The resource metrics pipeline only provides a small set of metrics for cluster components like the horizontal Pod autoscaler controller and the kubectl top function.

The metrics server discovers the nodes in the cluster and queries each node's kubelet to get the memory and CPU usage.

The kubelet is like a bridge between the master and the nodes. It translates each Pod into its containers and fetches container usage statistics.

The kubelet displays the Pod resource usage statistics through the metrics server API.

Full Metrics Pipeline

Kubernetes responds to metrics by scaling or adapting the cluster based on its current state. The monitoring pipeline collects the metrics from the kubelet and exposes them via an adapter through the following APIs:

custom.metrics.k8s.io

external.metrics.k8s.io

Metrics API

The metrics API gives the number of resources currently used by a specific node or pod.

1

The metrics API is discoverable through the same endpoint as other Kubernetes APIs under the path **/apis/metrics.K8s.Io/**

2

It offers **security**, **reliability**, and **scalability**.

Measure Resource Usage

CPU

CPU denotes compute processing and is reported as the average use in CPU cores over a period.

Memory

Working set is the memory that is in use and cannot be freed. Memory, measured in bytes, is the working set at the instant the metric was collected.

Metrics Server

The metrics server is the cluster-wide aggregator of resource usage data. It collects metrics from the summary API.

Monitoring Metrics API

Duration: 10 mins

Problem Statement:

You've been assigned a task to install the metrics API in our environment.

Assisted Practice: Guidelines

Steps to be followed:

1. Installing metrics API

Commands to Debug Networking Issues

Find a Pod’s Cluster IP

Run the following command to find the Cluster IP address of a Kubernetes Pod:

Demo

```
# to find the cluster IP address of a Kubernetes pod

$kubectl get pod -o wide



Output
NAME                               READY      STATUS     RESTARTS
AGE        IP              NODE
hello-world-5b446dd74b-7c7pk   1/1        Running    0
22m        10.244.18.4    node-one
hello-world-5b446dd74b-pxtzt   1/1        Running    0
22m        10.244.3.4     node-two
```

Find Service IP

Run the following command to find the service IP addresses under the CLUSTER-IP column:

Demo

```
# to list all services in all namespaces using kubectl

$kubectl get service


Output
NAMESPACE     NAME                          TYPE
CLUSTER-IP      EXTERNAL-IP   PORT(S)          AGE
default       kubernetes                    ClusterIP
10.32.0.1       <none>        443/TCP          6d
kube-system   csi-attacher-doplugin         ClusterIP
10.32.159.128   <none>        12345/TCP        6d
kube-system   csi-provisioner-doplugin      ClusterIP
10.32.61.61     <none>        12345/TCP        6d
kube-system   kube-dns                      ClusterIP
10.32.0.10      <none>        53/UDP,53/TCP    6d
kube-system   kubernetes-dashboard          ClusterIP
10.32.226.209   <none>        443/TCP          6d
```

Find and Enter Pod Network Namespaces

For docker, first list all the containers running on a node.

Demo

```
# to list the containers running on a node

docker ps

 Output
CONTAINER ID        IMAGE
COMMAND                      CREATED             STATUS
PORTS               NAMES
173ee46a3926        gcr.io/google-samples/node-hello
"/bin/sh -c 'node se…"   9 days ago          Up 9 days
k8s_hello-world_hello-world-5b446dd74b-
pxtzt_default_386a9073-7e35-11e8-8a3d-bae97d2c1afd_0
11ad51cb72df        k8s.gcr.io/pause-amd64:3.1
"/pause"                     9 days ago          Up 9 days
k8s_POD_hello-world-5b446dd74b-pxtzt_default_386a9073-
7e35-11e8-8a3d-bae97d2c1afd_0
. . .
```

Find and Enter Pod Network Namespaces

Next, find out the process ID of the container in the Pod that needs to be examined.

Demo

```
# to get the process ID of either container

docker inspect --format '{{ .State.Pid }}' container-id-
or-name

Output

14552
```

Find and Enter Pod Network Namespaces

Next, the **nsenter** command can be used to run a command in the process’s network namespace.

Demo

```
# to run a command in that process’s network namespace

nsenter -t your-container-pid -n ip addr
```

Find a Pod’s Virtual Interface

First, run the **nsenter** command to run a command in the process’s network namespace.

Demo

```
nsenter -t your-container-pid -n ip addr
```

```
Output
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue
state UNKNOWN group default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
10: eth0@if11: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1450
qdisc noqueue state UP group default
    link/ether 02:42:0a:f4:03:04 brd ff:ff:ff:ff:ff:ff
link-netnsid 0
    inet 10.244.3.4/24 brd 10.244.3.255 scope global eth0
       valid_lft forever preferred_lft forever
```

Inspect IP Table Rules

To inspect IP table rules, run the **IP table** command:

Demo

```
# to dump all iptables rules on a node

iptables-save

# to list just the Kubernetes Service NAT rules

iptables -t nat -L KUBE-SERVICES

Output

Chain KUBE-SERVICES (2 references)
target     prot opt source               destination
KUBE-SVC-TCOU7JCQXEZGVUNU  udp  --  anywhere
10.32.0.10          /* kube-system/kube-dns:dns cluster IP */
udp dpt:domain
KUBE-SVC-ERIFXISQEP7F7OF4  tcp  --  anywhere
10.32.0.10          /* kube-system/kube-dns:dns-tcp cluster IP
*/ tcp dpt:domain
KUBE-SVC-XGLOHA7QRQ3V22RZ  tcp  --  anywhere
10.32.226.209       /* kube-system/kubernetes-dashboard:
cluster IP */ tcp dpt:https
. . .
```

Examine IPVS Details

To list the translation table of IPs, use the following command:

Demo

```
# to list the translation table of IPs

ipvsadm -ln

Output

IP Virtual Server version 1.2.1 (size=4096)
Prot LocalAddress:Port Scheduler Flags
  -> RemoteAddress:Port           Forward Weight ActiveConn
InActConn
TCP  100.64.0.1:443 rr
  -> 178.128.226.86:443           Masq    1      0          0
TCP  100.64.0.10:53 rr
  -> 100.96.2.3:53                Masq    1      0          0
  -> 100.96.2.4:53                Masq    1      0          0
UDP  100.64.0.10:53 rr
  -> 100.96.2.3:53                Masq    1      0          0
  -> 100.96.2.4:53                Masq    1      0          0
```

Handling Component Failure Threshold

Duration: 10 mins

Problem Statement:

You’ve been assigned a task to handle component failure threshold.

Assisted Practice: Guidelines

Steps to be followed:

1. Listing cluster

Troubleshooting Networking Issues

Duration: 15 mins

Problem Statement:

You’ve been assigned a task to troubleshoot network issues in the Kubernetes environment.

Assisted Practice: Guidelines

Steps to be followed:

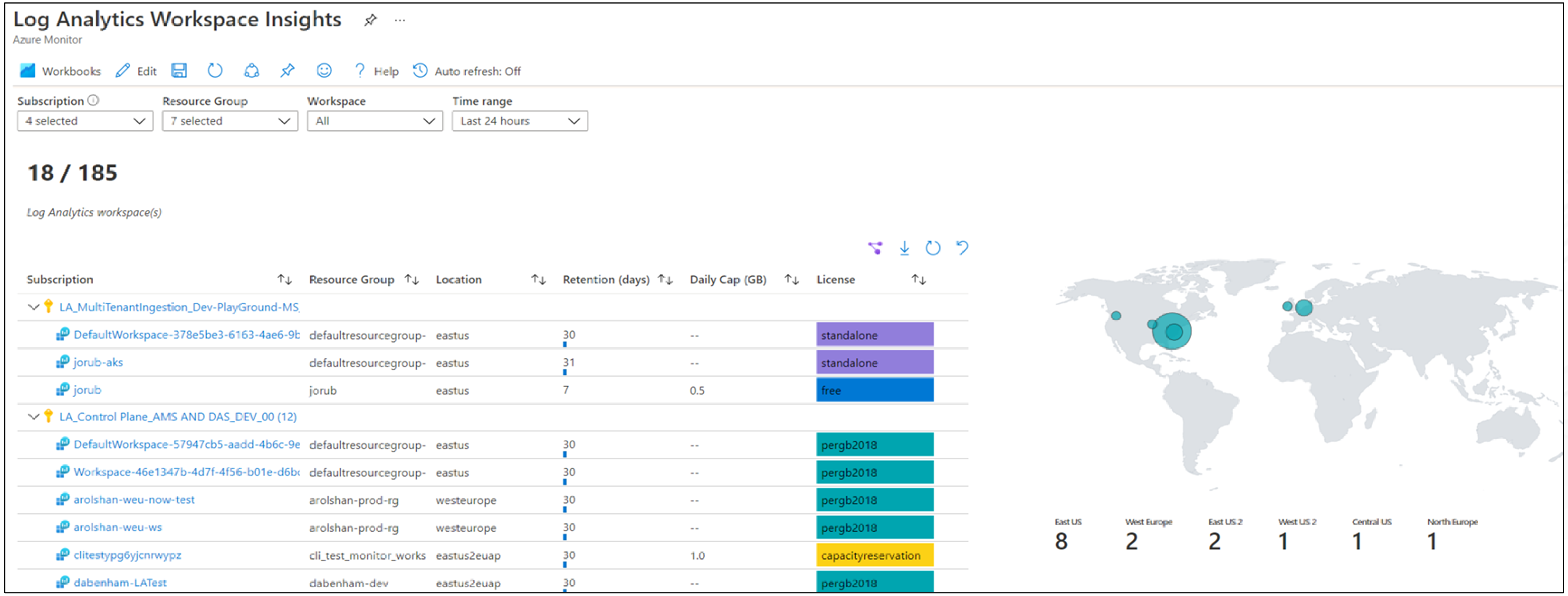
1. Getting started with Httpd-pod
2. Create Httpd service
3. Check labels for all Pods
4. Delete Httpd-service
5. Introducing the error

TECHNOLOGY

AKS Monitoring and Logging

Log Analytics Workspace

Log Analytics Workspace Insights (preview) provides comprehensive monitoring of your workspaces through a unified view of your workspace usage, performance, health, agent, queries, and change log.



Subscription: 4 selected
Resource Group: 7 selected
Workspace: All
Time range: Last 24 hours

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Log Analytics workspace(s)

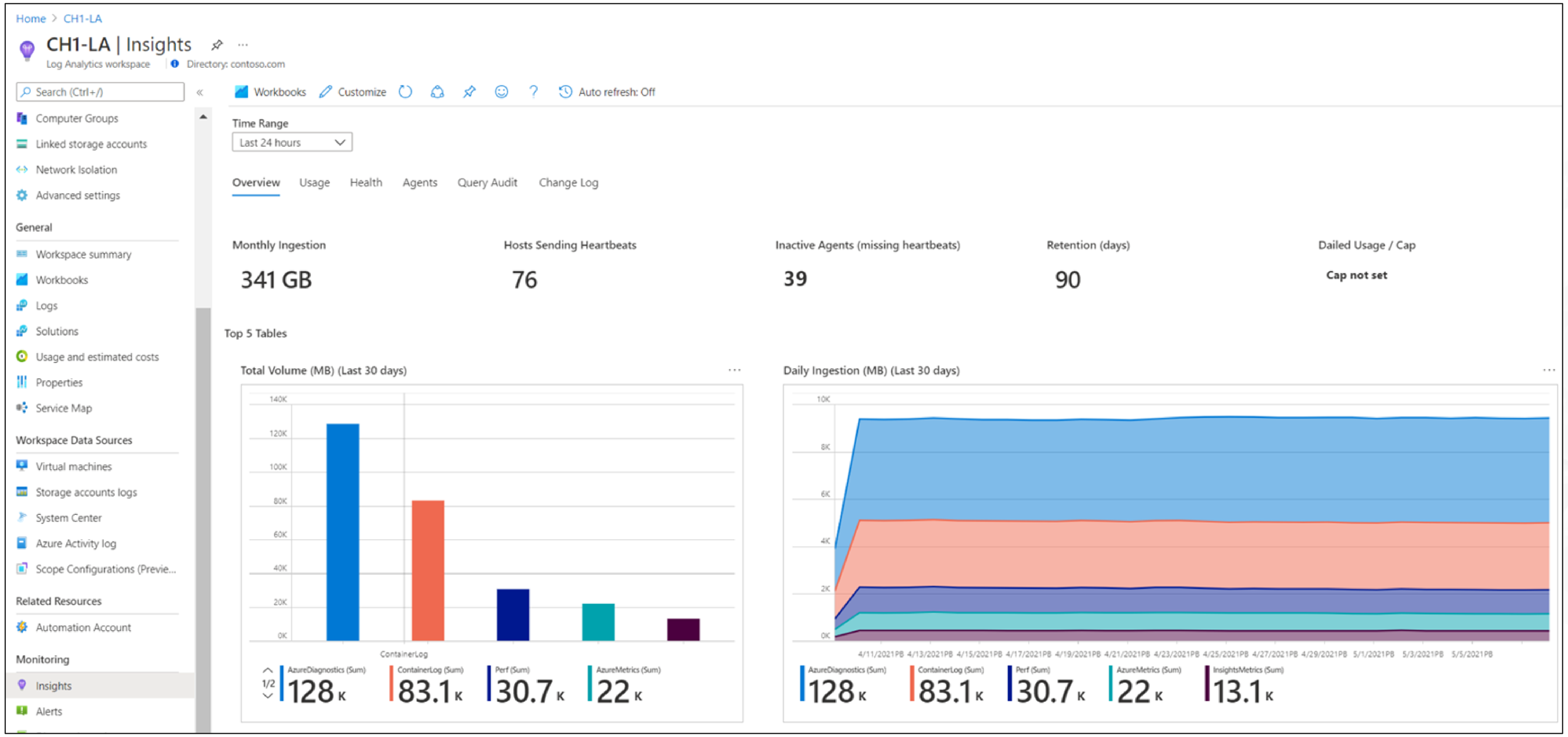
Subscription	Resource Group	Location	Retention (days)	Daily Cap (GB)	License
LA_MultiTenantIngestion_Dev-PlayGround-MS					
DefaultWorkspace-378e5be3-6163-4ae6-9b	defaultresourcegroup-	eastus	30	--	standalone
jorub-aks	defaultresourcegroup-	eastus	31	--	standalone
jorub	jorub	eastus	7	0.5	free
LA_Control Plane_AMS AND DAS_DEV_00 (12)					
DefaultWorkspace-57947cb5-aadd-4b6c-9e	defaultresourcegroup-	eastus	30	--	pergb2018
Workspace-46e1347b-4d7f-4f56-b01e-d6b	defaultresourcegroup-	eastus	30	--	pergb2018
arolshan-weu-now-test	arolshan-prod-rg	westeurope	30	--	pergb2018
arolshan-weu-ws	arolshan-prod-rg	westeurope	30	--	pergb2018
clitestypg6yjcnrwypz	cli_test_monitor_works	eastus2euap	30	1.0	capacityreservation
dabenham-LATest	dabenham-dev	eastus2euap	30	--	pergb2018

East US	West Europe	East US 2	West US 2	Central US	North Europe
8	2	2	1	1	1

https://docs.microsoft.com/en-us/azure/azure-monitor/logs/media/log-analytics-workspace-insights-overview/at-scale.png

Log Analytics Workspace

It helps manage multiple Clusters/Nodes and also monitors the performance of each of these components.



Time Range: Last 24 hours

Monthly Ingestion: 341 GB

Hosts Sending Heartbeats: 76

Inactive Agents (missing heartbeats): 39

Retention (days): 90

Dailed Usage / Cap: Cap not set

Total Volume (MB) (Last 30 days): AzureDiagnostics (Sum) 128 K; ContainerLog (Sum) 83.1 K; Perf (Sum) 30.7 K; AzureMetrics (Sum) 22 K

Daily Ingestion (MB) (Last 30 days): AzureDiagnostics (Sum) 128 K; ContainerLog (Sum) 83.1 K; Perf (Sum) 30.7 K; AzureMetrics (Sum) 22 K; InsightsMetrics (Sum) 13.1 K

https://docs.microsoft.com/en-us/azure/azure-monitor/logs/media/log-analytics-workspace-insights-overview/at-resource.png

Azure Monitor

- Azure Monitor stores log data in a Log Analytics workspace. A workspace is a container that includes data and configuration information.
- Azure Monitor stores the data of all the functioning components of the AKS Cluster.
- It also provides an RBAC to limit access to sensitive data and maintain security.

Case Studies

Case Study: ING

Location: Amsterdam, Netherlands

Industry: Finance

Challenge

After undergoing an Agile transformation, ING realized it needed a standardized platform to support its developers' work.

Solution

The company's team could build an internal public cloud for its CI/CD pipeline and green-field applications. It can accomplish this by employing Kubernetes for Container Orchestration and Docker for containerization.

Case Study: AdForm

Location: Copenhagen, Denmark

Industry: AdTech

Challenge

Maintenance of virtual machines or VMs led to slowing down technology and new software updates and the self-healing process

Solution

Adoption of Kubernetes to use new frameworks

Case Study: Pinterest

Location: San Francisco, California, USA

Industry: Web and Mobile

Challenge

Building the fastest path from an idea to production, without making engineers worry about the underlying infrastructure

Solution

Moving services to Docker Containers

Case Study: Nokia

Location: Espoo, Finland

Industry: Telecommunications

Challenge

Deliver software to several telecom operators and add the software to their infrastructure

Solution

A shift to cloud native technologies would help teams to have infrastructure-agonistic behavior in their products

Key Takeaways

- Elements like Virtual Machines, Pods, containers, and nodes support troubleshooting in a Kubernetes environment.
- Common logging methods for containerized applications are writing to standard output and error stream.
- Cluster-level logging enables access to application logs even if a node dies, a Pod gets evicted, or a container crashes.
- For diagnosing the problem in the application, first assess whether the problem lies in the Pods, replication controller, or services.