Logging and Monitoring in Kubernetes Clusters

Anthony E. Nocentino
ENTERPRISE ARCHITECT @ CENTINO SYSTEMS
@nocentino www.centinosystems.com

Course Overview

Maintaining Kubernetes Clusters

Logging and Monitoring in Kubernetes Clusters

Troubleshooting Kubernetes Clusters

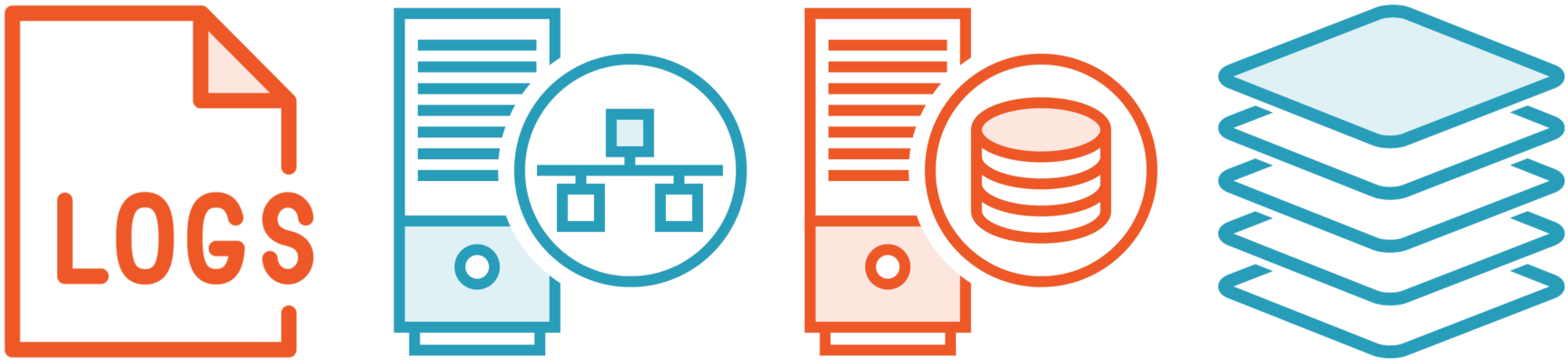
Summary

Logging architecture

Accessing objects with JSONPath

Accessing performance data with the Kubernetes Metric Server

Logging in Kubernetes



Containers and Pods

Nodes

Control Plane

Events

Logging Architecture - Pods and Containers

`stdout and stderr`	Logging Driver `/var/log/containers`	Two logs are retained on the Node
Log Aggregation	`kubectl logs`	Log rotation

https://kubernetes.io/docs/concepts/cluster-administration/logging/

Accessing Log Data - Pods and Containers

```
kubectl logs $POD_NAME

kubectl logs $POD_NAME -c $CONTAINER_NAME

docker logs $CONTAINER_NAME

tail /var/log/containers/$CONTAINER_NAME_$CONTAINER_ID
```

Logging Architecture - Nodes

kubelet	kube-proxy
systemd service	Pod
journald	kubectl logs
journalctl kubelet.service	/var/log/containers
/var/log/kubelet.log	/var/log/kube-proxy
Local operating system logs	

Logging Architecture - Control Plane

Run as Pods

```
kubectl logs -n kube-system $PODNAME
docker logs $CONTAINERNAME
/var/log/containers
```

systemd based system logs to journald

Everywhere else...

```
/var/log/kube-apiserver.log
/var/log/kube-scheduler.log
/var/log/kube-controller-manager.log
```

Kubernetes Events

Logs for resources defined in the cluster

Changes in resource state

Go to log for when something goes wrong

```
kubectl get events
```

```
kubectl describe $TYPE $NAME
```

One hour retention

Demo

Kubernetes logging architecture

- Pods
- Worker Nodes
- Control Plane

Accessing Cluster Events

Accessing Object Data with JSONPath

kubectl supports JSONPath

Write expressions to access, filter, sort and format object data

Precise operations on objects

https://kubernetes.io/docs/reference/kubectl/jsonpath/

```
#List just all pod names
kubectl get pods -o jsonpath='{ .items[*].metadata.name }'

#Get all container images in use by all pods in all namespaces
kubectl get pods --all-namespaces  \
    -o jsonpath='{ .items[*].spec.containers[*].image }'
```

Accessing Objects with JSONPath

Accessing Objects with JSONPath

.items[*].metadata.name

.items[*].spec.containers[*].image

```
"items": [
    {
        "apiVersion": "v1",
        "kind": "Pod",
        "metadata": {
            "name": "nginx-86c57db685-fmwk6",
             ...
        }
        "spec": {
                  ...
            "containers": [
                {
                    "image": “nginx”,
                }
            ]
              ...
            }
        }
    ]
```

```
#Get all Internal IP Addresses of Nodes in a cluster
kubectl get nodes \
    -o jsonpath="{ .items[*].status.addresses[?(@.type=='InternalIP')].address }"
```

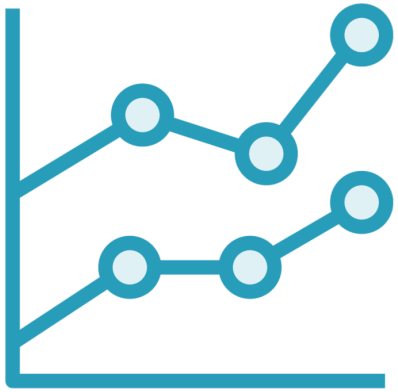
Filtering Objects with JSONPath

Demo

Using JSONpath output to access object data

- Accessing
- Filtering
- Sorting

Monitoring in Kubernetes



Observe

Measure changes

Resource limits

Kubernetes Metrics Server

Provides resources metrics Pods and Nodes

- Point in time

Collects resource metrics from kubelets

CPU and Memory

```
kubectl top pods
kubectl top nodes
```

https://github.com/kubernetes-sigs/metrics-server

Demo

Using kubectl top to analyze resource consumption for Pods and Nodes

Review

Logging architecture

Accessing objects with JSONPath

Accessing performance data with the Kubernetes Metric Server

Up Next:
Troubleshooting Kubernetes Clusters