



# DevOps Shack

## Kubernetes Tips & Useful Tricks With Usecases | Part-1,2,3,4,5,6,7

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### Part 1: Basic Kubernetes Commands & Tricks

#### 1. Viewing Cluster Information

```
kubectl cluster-info
```

- **Use Case:** Quickly get addresses of the master and services.

#### 2. Get Resources

```
kubectl get all
```

- **Use Case:** List all resources in the current namespace.

#### 3. Using Kubectl Autocomplete

- **Setup for Bash:**

```
source <(kubectl completion bash)
```

- **Setup for Zsh:**

```
source <(kubectl completion zsh)
```

- **Use Case:** Speed up command entry with autocomplete.

## 4. Delete All Resources in a Namespace

```
kubectl delete all --all
```

- **Use Case:** Clean up a namespace for a fresh start.

## 5. Stream Pod Logs

```
kubectl logs -f [POD_NAME]
```

- **Use Case:** Follow log output in real time.

## 6. Execute Commands Inside a Pod

```
kubectl exec -it [POD_NAME] -- /bin/bash
```

- **Use Case:** Access the shell inside a pod.

## 7. Quickly Create and Expose a Pod

```
kubectl run mynginx --image=nginx --restart=Never --port=80  
kubectl expose pod mynginx --port=80 --type=NodePort
```

- **Use Case:** Rapidly deploy and expose a simple application.

## 8. List All Pods in All Namespaces

```
kubectl get pods --all-namespaces
```

- **Use Case:** Overview of all pods across the cluster.

## 9. Output in YAML Format

```
kubectl get pod [POD_NAME] -o yaml
```

- **Use Case:** Get detailed configurations of resources.

## 10. Scale a Deployment Quickly

```
kubectl scale deployment [DEPLOYMENT_NAME] --replicas=10
```

- **Use Case:** Modify the number of replicas dynamically.

## 11. Rollout History of a Deployment

```
kubectl rollout history deployment/[DEPLOYMENT_NAME]
```

- **Use Case:** Check the history and revisions of a deployment.

## 12. Undo a Deployment to a Previous State

```
kubectl rollout undo deployment/[DEPLOYMENT_NAME]
```

- **Use Case:** Revert to a previous deployment state if issues occur.

## 13. Apply Configuration From a File

```
kubectl apply -f [CONFIG_FILE.yaml]
```

- **Use Case:** Deploy or update resources in bulk.

## 14. Get Resource Manifest by Labels

```
kubectl get pods -l app=nginx
```

- **Use Case:** Filter resources based on specific labels.

## 15. Create a Resource Quota

```
kubectl create quota my-quota --hard=cpu=10,memory=10Gi,pods=10
```

- **Use Case:** Limit resource usage per namespace.

## 16. Drain a Node for Maintenance

```
kubectl drain [NODE_NAME] --ignore-daemonsets
```

- **Use Case:** Safely evacuate all pods from a node for maintenance.

## 17. Watch Resource Changes in Real-Time

```
kubectl get pods --watch
```

- **Use Case:** Monitor updates to pods in real-time.

## 18. Copy Files From Pod to Local Machine

```
kubectl cp [NAMESPACE]/[POD_NAME]:/path/to/remote/file /path/to/local/file
```

- **Use Case:** Transfer files between pod and local system.

## 19. Delete Pods Not in a Running State

```
kubectl get pods | grep -v Running | cut -d' ' -f1 | xargs kubectl delete pod
```

- **Use Case:** Clean up non-running pods to maintain a healthy environment.

## 20. Port Forward to Local Machine

```
kubectl port-forward [POD_NAME] [LOCAL_PORT]:[REMOTE_PORT]
```

- **Use Case:** Access and manage services from a local machine.

# Part 2: Intermediate Kubernetes Commands & Operational Tricks

## 21. Check Cluster Resource Availability

```
kubectl top nodes
```

- **Use Case:** Monitor the usage of CPU and memory resources across nodes in the cluster.

## 22. Label a Node for Specific Deployments

```
kubectl label nodes [NODE_NAME] hardware=high-spec
```

- **Use Case:** Assign labels to nodes to target them with specific pods that require higher specifications.

## 23. Get Detailed Node Information

```
kubectl describe node [NODE_NAME]
```

- **Use Case:** Fetch detailed information about a node, including its status, labels, conditions, and assigned pods.

## 24. Taint a Node to Control Pod Placement

```
kubectl taint nodes [NODE_NAME] key=value:NoSchedule
```

- **Use Case:** Apply a taint to a node to prevent pods from being scheduled on it unless they tolerate the taint.

## 25. Patch a Running Pod

```
kubectl patch pod [POD_NAME] -p  
'{"spec":{"containers":[{"name":"[CONTAINER_NAME]","image":"[NEW_IMAGE]"}]}}'  
'
```

- **Use Case:** Update a specific aspect of a running pod, such as the container image.

## 26. Decode Secrets

```
kubectl get secret [SECRET_NAME] -o jsonpath="{.data.token}" | base64 --decode
```

- **Use Case:** Decode and view Kubernetes secrets, which are stored encoded by default.

## 27. Export Current State of Resources to a File

```
kubectl get deployment [DEPLOYMENT_NAME] -o yaml --export > deployment.yaml
```

- **Use Case:** Save the current state of a deployment or any other resource to a YAML file for backup or replication.

## 28. Restart a Deployment

```
kubectl rollout restart deployment/[DEPLOYMENT_NAME]
```

- **Use Case:** Restart all pods in a deployment, useful for refreshing the application without changing the deployment configuration.

## 29. Use JSON Path Queries for Custom Outputs

```
kubectl get pods -o=jsonpath='{range .items[*]}{.metadata.name}{"\t"}{.status.phase}{"\n"}{end}'
```

- **Use Case:** Customize the output of `kubectl` commands to display specific data fields in a specified format.

## 30. Change Namespace for the Current Context

```
kubectl config set-context --current --namespace=[NAMESPACE]
```

- **Use Case:** Switch the default namespace of the current context, simplifying commands that follow.

## 31. Simplify Complex Kubernetes YAML with Kustomize

- **Usage:**

```
kubectl apply -k [KUSTOMIZATION_DIRECTORY]
```

- **Use Case:** Manage application configuration with Kustomize, which allows for template-free customization of multiple Kubernetes manifests.

## 32. Monitor Pod Disruption Budgets

```
kubectl get poddisruptionbudgets
```

- **Use Case:** Ensure that the minimum number of replicas of an application remain available during voluntary disruptions.

### 33. Schedule Jobs for Specific Times

```
apiVersion: batch/v1beta1
kind: CronJob
metadata:
  name: example-cronjob
spec:
  schedule: "*/5 * * * *"
  jobTemplate:
    spec:
      template:
        spec:
          containers:
            - name: example-container
              image: busybox
              args:
                - /bin/sh
                - -c
                - date; echo Hello from the Kubernetes cluster
              restartPolicy: OnFailure
```

- **Use Case:** Run batch jobs at specific times using CronJob resources.

### 34. Interactively Manage and Debug Pods

```
kubectl run -i --tty busybox --image=busybox -- sh
```

- **Use Case:** Launch an interactive shell session within a pod for troubleshooting and debugging.

### 35. Analyze and Debug Network Policies

```
kubectl run --generator=run-pod/v1 tmp-shell --rm -it --image
nicolaka/netshoot -- bash
```

- **Use Case:** Use a temporary pod with network troubleshooting tools to test and debug network policies.

### 36. View Evicted Pods

```
kubectl get pods --field-selector=status.phase=Failed
```

- **Use Case:** Identify pods that have been evicted due to resource constraints or node failures.

### 37. Automate Service Exposure

```
kubectl expose deployment [DEPLOYMENT_NAME] --port=[PORT] --
type=LoadBalancer
```

- **Use Case:** Quickly create a service that exposes a deployment externally, allocating a public IP if on a supported cloud provider.

### 38. Force Delete Pods in Terminating State

```
kubectl delete pods [POD_NAME] --grace-period=0 --force
```

- **Use Case:** Forcefully delete pods that are stuck in a terminating state, which can occur due to various issues.

### 39. Backup and Restore Etcd

- **Backup:**

```
ETCDCTL_API=3 etcdctl snapshot save snapshot.db
```

- **Restore:**

```
ETCDCTL_API=3 etcdctl snapshot restore snapshot.db
```

- **Use Case:** Safeguard and recover the Kubernetes cluster's state by backing up and restoring the Etcd datastore.

### 40. Aggregate Logs Using Stern

- **Command:**

```
stern [POD_NAME_PATTERN] --since 1h
```

- **Use Case:** Tail logs from multiple pods matching the name pattern, useful for debugging applications spanning multiple pods.

## Part 3: Advanced Kubernetes Commands & Performance Tricks

### 41. Use Node Affinity to Control Pod Placement

```
apiVersion: v1
kind: Pod
metadata:
  name: with-node-affinity
spec:
  containers:
  - name: with-node-affinity
    image: k8s.gcr.io/pause:2.0
  affinity:
    nodeAffinity:
      requiredDuringSchedulingIgnoredDuringExecution:
        nodeSelectorTerms:
        - matchExpressions:
          - key: kubernetes.io/e2e-az-name
            operator: In
            values:
```

- e2e-az1
- e2e-az2

- **Use Case:** Ensure pods are scheduled on nodes in specific availability zones, enhancing performance and reliability.

## 42. Horizontal Pod Autoscaler Based on Custom Metrics

```
apiVersion: autoscaling/v2beta2
kind: HorizontalPodAutoscaler
metadata:
  name: custom-metric-hpa
spec:
  scaleTargetRef:
    apiVersion: apps/v1
    kind: Deployment
    name: my-deployment
  minReplicas: 1
  maxReplicas: 10
  metrics:
  - type: Pods
    pods:
      metric:
        name: packets-processed
      target:
        type: AverageValue
        averageValue: 1000
```

- **Use Case:** Scale applications dynamically based on custom metrics like processed packets, optimizing resource use and application responsiveness.

## 43. Optimize Cluster Scheduling with Pod Priority and Preemption

```
apiVersion: scheduling.k8s.io/v1
kind: PriorityClass
metadata:
  name: high-priority
value: 1000000
globalDefault: false
description: "This priority class should be used for XYZ service pods only."
---
apiVersion: v1
kind: Pod
metadata:
  name: high-priority-pod
spec:
  containers:
  - name: high-priority
    image: nginx
  priorityClassName: high-priority
```

- **Use Case:** Prioritize critical service pods over others, ensuring they are scheduled and run preferentially.

## 44. Isolate Namespaces Using Network Policies



```

apiVersion: networking.k8s.io/v1
kind: NetworkPolicy
metadata:
  name: default-deny-all
  namespace: restricted
spec:
  podSelector: {}
  policyTypes:
    - Ingress
    - Egress

```

- **Use Case:** Enhance security by default denying all ingress and egress traffic in sensitive namespaces, requiring explicit allowances.

## 45. Monitor API Server Requests

```
kubectl top --sort-by=cpu
```

- **Use Case:** Identify which components or services are consuming the most CPU resources on the API server, helping in diagnosing performance issues.

## 46. Graceful Pod Shutdown with PreStop Hook

```

apiVersion: v1
kind: Pod
metadata:
  name: lifecycle-demo
spec:
  containers:
    - name: lifecycle-demo
      image: nginx
      lifecycle:
        preStop:
          exec:
            command: ["/usr/sbin/nginx", "-s", "quit"]

```

- **Use Case:** Ensure that services handle termination signals gracefully, allowing them to finish critical tasks before shutdown.

## 47. Optimize Persistent Volume Usage with StorageClasses

```

apiVersion: storage.k8s.io/v1
kind: StorageClass
metadata:
  name: fast
provisioner: kubernetes.io/gce-pd
parameters:
  type: pd-ssd

```

- **Use Case:** Define storage classes with different performance characteristics, such as SSDs for high-throughput applications.

## 48. Advanced Logging with Fluentd

- **Setup Fluentd to Aggregate and Forward Logs:**

```
kubectl create -f https://k8s.io/examples/debug/fluentd-daemonset.yaml
```

- **Use Case:** Collect logs from all nodes and pods, forwarding them to a central logging service like Elasticsearch for more sophisticated analysis.

## 49. Control Pod Egress Traffic Using Egress Gateway

- **Implement an Egress Gateway:**

```
apiVersion: networking.k8s.io/v1
kind: NetworkPolicy
metadata:
  name: allow-egress
  namespace: default
spec:
  podSelector:
    matchLabels:
      role: gateway
  egress:
  - to:
    - ipBlock:
        cidr: 1.2.3.4/32
```

- 

**Use Case:** Regulate and monitor outbound traffic from your cluster to meet compliance and security requirements.

## 50. Use Init Containers for Setup Scripts

```
apiVersion: v1
kind: Pod
metadata:
  name: myapp-pod
spec:
  containers:
  - name: myapp-container
    image: myapp
  initContainers:
  - name: init-myservice
    image: busybox
    command: ['sh', '-c', 'echo initializing && sleep 1']
```

- **Use Case:** Execute preliminary setup tasks before the main application starts, ensuring that all dependencies or prerequisites are met.

# Part 4: Advanced Kubernetes Commands & Cluster Management Tricks

## 51. Automatically Replace Unhealthy Nodes

```
kubectl get nodes --no-headers | awk '{if ($2 != "Ready") print $1}' |  
xargs kubectl delete node
```

- **Use Case:** Automatically identify and remove nodes that are not in the 'Ready' state, ensuring the cluster's health and reliability.

## 52. Set Resource Limits for Namespace

```
apiVersion: v1  
kind: ResourceQuota  
metadata:  
  name: mem-cpu-quota  
  namespace: prod  
spec:  
  hard:  
    requests.cpu: "1"  
    requests.memory: 1Gi  
    limits.cpu: "2"  
    limits.memory: 2Gi
```

- **Use Case:** Enforce specific CPU and memory limits at the namespace level to prevent any one project from consuming excessive cluster resources.

## 53. Use Custom Scheduler for Specialized Workloads

```
apiVersion: v1  
kind: Pod  
metadata:  
  name: with-custom-scheduler  
spec:  
  schedulerName: my-scheduler  
  containers:  
  - name: nginx  
    image: nginx
```

- **Use Case:** Deploy pods using a custom scheduler tailored to specific needs or optimizations, instead of the default Kubernetes scheduler.

## 54. Manage Cluster Access with Role-Based Access Control (RBAC)

```
apiVersion: rbac.authorization.k8s.io/v1  
kind: Role  
metadata:  
  namespace: default  
  name: pod-reader  
rules:  
- apiGroups: [""]  
  resources: ["pods"]  
  verbs: ["get", "watch", "list"]
```

- **Use Case:** Secure your Kubernetes environment by specifying who can access which resources, ensuring users only have the necessary permissions.

## 55. Advanced Pod Scheduling with Affinity and Anti-Affinity

```
apiVersion: v1
kind: Pod
metadata:
  name: with-pod-affinity
spec:
  affinity:
    podAffinity:
      requiredDuringSchedulingIgnoredDuringExecution:
        - labelSelector:
            matchExpressions:
              - key: security
                operator: In
                values:
                  - S1
          topologyKey: "kubernetes.io/hostname"
  containers:
    - name: myapp
      image: myapp
```

- **Use Case:** Place pods based on the labels of other pods and the nodes they are located on, enhancing the co-location or distribution of workloads across the cluster.

## 56. Encrypt Secrets at Rest

```
apiVersion: v1
kind: Secret
metadata:
  name: mysecret
type: Opaque
data:
  username: YWRtaW4=
  password: MWYyZDFlMmU2N2Rm
```

- **Configuration:**

```
# Enable encryption at rest in Kubernetes by configuring the API server
# with a proper encryption provider configuration.
```

- **Use Case:** Protect sensitive data, ensuring that secrets like passwords or API keys are encrypted in storage, not just in transit.

## 57. Configure Automatic Sidecar Injection with Istio

- **Enable Istio on a Namespace:**

```
kubectl label namespace default istio-injection=enabled
```

- **Use Case:** Automatically add an Istio sidecar proxy to eligible pods within a namespace to secure and manage network traffic.

## 58. Monitor Resource Usage in Real-Time

```
kubectl top pod --containers
```

- **Use Case:** Display current CPU and memory usage for each container in a pod, helping in quick diagnostics and resource management.

## 59. Automate Certificate Management with Cert-Manager

- **Install Cert-Manager:**

```
kubectl create namespace cert-manager
kubectl apply --validate=false -f https://github.com/jetstack/cert-
manager/releases/download/v1.0.4/cert-manager.yaml
```

- **Use Case:** Automate the issuance and renewal of SSL/TLS certificates, ensuring secure communication within the cluster.

## 60. Efficiently Handle Node Evacuation

```
kubectl drain [NODE_NAME] --ignore-daemonsets --delete-emptydir-data
```

- **Use Case:** Safely evacuate all pods from a node while respecting Kubernetes' data management policies, ideal for performing maintenance or upgrades without data loss.

## 61. Leverage Kubernetes Events for Troubleshooting

```
kubectl get events --sort-by='.metadata.creationTimestamp'
```

- **Use Case:** Gather a chronological order of cluster events to troubleshoot and understand

the sequence of actions that have affected the cluster.

## 62. Configure Pod Disruption Budgets for High Availability

```
apiVersion: policy/v1beta1
kind: PodDisruptionBudget
metadata:
  name: my-pdb
spec:
  minAvailable: 1
  selector:
    matchLabels:
      app: myapp
```

- **Use Case:** Protect critical applications from voluntary disruptions during maintenance, ensuring at least a certain number of replicas remain running.

## 63. Utilize Vertical Pod Autoscaling

- **Enable VPA:**

```
kubectl apply -f
https://raw.githubusercontent.com/kubernetes/autoscaler/master/vertical-
pod-autoscaler/deploy/recommended.yaml
```

- **Use Case:** Automatically adjust the CPU and memory reservations of pods based on their usage, optimizing resource allocation.

## 64. Implement Network Policies for Pod Security

```
apiVersion: networking.k8s.io/v1
kind: NetworkPolicy
metadata:
  name: restrict-internal-traffic
spec:
  podSelector:
    matchLabels:
      role: db
  policyTypes:
  - Ingress
  ingress:
  - from:
    - podSelector:
        matchLabels:
          role: frontend
```

- **Use Case:** Define rules that restrict how pods communicate with each other, improving the security posture of your environment by preventing unauthorized access.

## 65. Backup Kubernetes Cluster Data Using Velero

- **Install Velero:**

```
velero install --provider aws --bucket my-backup --secret-file
./credentials-velero
```

- **Use Case:** Provide comprehensive backups of cluster resources and persistent volumes, enabling disaster recovery strategies.

# Part 5: Advanced Kubernetes Commands & Security Enhancements

## 66. Secure Pod-to-Pod Communication with Network Policies

```
apiVersion: networking.k8s.io/v1
kind: NetworkPolicy
metadata:
  name: default-deny
spec:
```

```
podSelector: {}
policyTypes:
- Ingress
- Egress
```

- **Use Case:** Establish a default deny all network posture, forcing all traffic to be explicitly permitted, which enhances the security of pod communications.

## 67. Automated Security Scans with Kube-Bench

- **Command:**

```
kubectrl apply -f https://raw.githubusercontent.com/aquasecurity/kube-bench/main/job.yaml
```

- **Use Case:** Run the CIS Kubernetes Benchmark to check for dozens of common best-practices around deploying Kubernetes securely.

## 68. Use Helm for Managing Complex Deployments

```
helm install my-release stable/my-chart
```

- **Use Case:** Simplify the deployment and management of complex Kubernetes applications with Helm charts, providing templating, versioning, and release management.

## 69. Implement Readiness and Liveness Probes

```
apiVersion: v1
kind: Pod
metadata:
  name: mypod
spec:
  containers:
  - name: mycontainer
    image: myimage
    readinessProbe:
      httpGet:
        path: /healthz
        port: 8080
    livenessProbe:
      tcpSocket:
        port: 8080
```

- **Use Case:** Ensure that your applications are running smoothly and are accessible with probes that check the health of containers.

## 70. Optimize Cluster Logs with EFK Stack (Elasticsearch, Fluentd, Kibana)

- **Setup:**

```
kubectl apply -f https://github.com/elastic/cloud-on-k8s/tree/master/config/samples
```

- **Use Case:** Centralize logging across the cluster for better insights and debugging capabilities using a robust logging stack.

## 71. Automate Database Backups with CronJobs

```
apiVersion: batch/v1beta1
kind: CronJob
metadata:
  name: db-backup
spec:
  schedule: "0 2 * * *"
  jobTemplate:
    spec:
      template:
        spec:
          containers:
            - name: db-backup
              image: mydbbackup:latest
              env:
                - name: DB_HOST
                  value: mydbhost
```

- **Use Case:** Schedule regular database backups to ensure data durability and recoverability.

## 72. Isolate Sensitive Workloads with Service Mesh (Istio)

- **Setup Istio:**

```
istioctl install --set profile=demo
```

- **Use Case:** Enhance security, observability, and traffic management of services with a service mesh that offers fine-grained control and encryption.

## 73. Manage Cluster Secrets with HashiCorp Vault

- **Integration:**

```
vault operator init
```

- **Use Case:** Secure, store, and tightly control access to tokens, passwords, certificates, and other secrets in modern computing environments.

## 74. Scale Stateful Applications with StatefulSets

```
apiVersion: apps/v1
kind: StatefulSet
metadata:
  name: mystatefulapp
```



```
spec:
  serviceName: "mystatefulservice"
  replicas: 3
  selector:
    matchLabels:
      app: mystatefulapp
  template:
    metadata:
      labels:
        app: mystatefulapp
    spec:
      containers:
        - name: mycontainer
          image: myimage
```

- **Use Case:** Manage stateful applications with stable, unique network identifiers, stable persistent storage, and ordered deployment and scaling.

## 75. Dynamic Configuration with ConfigMaps and Secrets

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: myconfig
data:
  config.json: |
    {"key": "value"}
---
apiVersion: v1
kind: Secret
metadata:
  name: mysecret
type: Opaque
data:
  password: MWYyZDFlMmU2N2Rm
```

- **Use Case:** Manage configuration data and sensitive information separately from the pod specification, allowing for easier application configuration and security.

## 76. Enhance Node Security with Pod Security Policies

```
apiVersion: policy/v1beta1
kind: PodSecurityPolicy
metadata:
  name: restricted
spec:
  privileged: false

allowPrivilegeEscalation: false
```

- **Use Case:** Enforce security-related policies like preventing privileged containers, which can be crucial for maintaining the security posture of your cluster.

## 77. Zero-downtime Deployments with Rolling Updates

```

apiVersion: apps/v1
kind: Deployment
metadata:
  name: myapp
spec:
  strategy:
    type: RollingUpdate
    rollingUpdate:
      maxUnavailable: 0
      maxSurge: 1
  template:
    metadata:
      labels:
        app: myapp
    spec:
      containers:
        - name: mycontainer
          image: myimage:v2

```

- **Use Case:** Update applications with no downtime by ensuring that the new version is tested and rolled out gradually while the old version is still running.

## 78. Track Resource Usage with Metrics Server

```

kubectl apply -f https://github.com/kubernetes-sigs/metrics-
server/releases/latest/download/components.yaml

```

- **Use Case:** Monitor resource usage of nodes and pods in your cluster, enabling auto-scaling and more informed resource allocation decisions.

## 79. Use Kubernetes Dashboard for Cluster Management

- **Setup Dashboard:**

```

kubectl apply -f
https://raw.githubusercontent.com/kubernetes/dashboard/v2.0.0/aio/deploy/re
commended.yaml

```

- **Use Case:** Access an intuitive web-based user interface for managing and troubleshooting Kubernetes cluster resources.

## 80. Customize Pod Scheduling with Taints and Tolerations

```

apiVersion: v1
kind: Pod
metadata:
  name: mypod
spec:
  containers:
    - name: mycontainer
      image: myimage
  tolerations:
    - key: "app"
      operator: "Exists"
      effect: "NoSchedule"

```

- **Use Case:** Ensure that certain nodes only accept specific types of pods, allowing you to segregate workloads based on requirements like performance or security.

## Part 7: Enhanced Operational Strategies in Kubernetes

### 91. Automate Security Patching with Kured

- **Install Kured:**

```
kubectl apply -f  
https://github.com/weaveworks/kured/releases/download/1.6.1/kured-  
1.6.1.yaml
```

- **Use Case:** Use Kured (Kubernetes REboot Daemon) to safely automate node reboots after security updates, minimizing manual intervention and maintaining security compliance.

### 92. Data Encryption in Transit with mTLS

- **Configure Istio for mTLS:**

```
istioctl install --set values.global.mtls.enabled=true  
kubectl label namespace default istio-injection=enabled
```

- **Use Case:** Secure all data in transit within the cluster by enabling mutual TLS, ensuring that all communications between services are encrypted.

### 93. Backup and Restore Cluster Data with Stash

- **Install Stash:**

```
kubectl apply -f https://raw.githubusercontent.com/stashed/stash/v0.9.0-  
rc.2/deploy/kubernetes.yaml
```

- **Use Case:** Implement a robust backup and recovery strategy for Kubernetes resources and persistent volumes, ensuring data integrity and availability.

### 94. Integrate OPA (Open Policy Agent) for Policy Enforcement

```
kubectl create namespace opa  
kubectl apply -f https://raw.githubusercontent.com/open-policy-  
agent/opa/main/quick_start.yaml
```

- **Use Case:** Enforce fine-grained, context-aware policies across the Kubernetes stack to maintain compliance and governance standards.

## 95. Optimize Cost with Spot Instances

- **Configure Spot Instances:**

```
apiVersion: autoscaling.k8s.io/v1
kind: ClusterAutoscaler
metadata:
  name: cluster-autoscaler
spec:
  behavior:
    scaleDown:
      enabled: true
      utilizationThreshold: 0.5
```

- **Use Case:** Leverage spot instances for non-critical workloads to significantly reduce costs without compromising performance.

## 96. Implement GitOps for Kubernetes Management

- **Setup ArgoCD:**

```
kubectl create namespace argocd
kubectl apply -n argocd -f
https://raw.githubusercontent.com/argoproj/argo-
cd/stable/manifests/install.yaml
```

- **Use Case:** Manage and synchronize Kubernetes resources directly from Git repositories, enabling version-controlled and declarative infrastructure.

## 97. Enhance Logging with Loki

- **Install Loki:**

```
kubectl apply -f
https://raw.githubusercontent.com/grafana/loki/main/production/ksonnet/loki
/install.yaml
```

- **Use Case:** Implement a horizontally scalable, highly available, multi-tenant log aggregation system based on the same design as Prometheus.

## 98. Cluster Federation for Global Load Balancing

- **Setup Cluster Federation:**

```
kubefedctl federate enable clusters
```

- **Use Case:** Manage multiple Kubernetes clusters as a single entity with unified deployment and scaling strategies, improving global availability and load distribution.

## 99. Track Configuration Drift with Datree

- **Integrate Datree:**

```
kubectl apply -f  
https://raw.githubusercontent.com/datreeio/datree/blame/main/installation.y  
aml
```

- **Use Case:** Automatically check Kubernetes configurations against best practices to prevent drift and ensure consistent configurations across deployments.

## 100. Leverage Service Mesh for Advanced Traffic Management

- **Configure Advanced Istio Features:**

```
istioctl install --set profile=default --set  
values.telemetry.v2.enabled=true
```

- **Use Case:** Utilize service mesh capabilities to control traffic flow, implement advanced routing rules, and gain in-depth telemetry insights.