**Kubernetes Container Runtime Configuration Guide**

**1. Changing Container Runtimes in Minikube**

**Supported Runtimes:**

* **Docker** (default)
* **containerd**
* **CRI-O**

**Why Change Runtimes?**

* Production clusters often use containerd or CRI-O
* Better security profiles
* Reduced resource overhead
* Compliance requirements

**2. Step-by-Step Runtime Change Process**

**1. Stop and Delete Existing Cluster**

minikube stop

minikube delete

**2. Start New Cluster with Different Runtime**

# For CRI-O

minikube start --driver=virtualbox --container-runtime=cri-o

# For containerd

minikube start --driver=virtualbox --container-runtime=containerd

**Note:** Avoid Docker driver when changing runtimes as it may cause conflicts.

**3. Verifying the Runtime Change**

**Check Node Components**

minikube ssh -- sudo crictl ps

Expected output shows containers running under new runtime.

**Runtime-Specific Commands**

| **Runtime** | **Command to List Containers** |
| --- | --- |
| Docker | docker ps |
| containerd | sudo ctr containers ls |
| CRI-O | sudo crictl ps |

**4. Deploying Applications with New Runtime**

**No Changes Required!**

* Kubernetes abstracts runtime through CRI (Container Runtime Interface)
* Same YAML files work across all runtimes
* Deployment process remains identical

**5. Runtime-Specific Considerations**

**CRI-O Features:**

* Lightweight OCI-compliant runtime
* Designed specifically for Kubernetes
* Strong security defaults

**containerd Features:**

* More mature than CRI-O
* Broader container ecosystem support
* Used by Docker internally

**6. Troubleshooting Runtime Issues**

**Common Problems:**

1. **Image Pull Failures**:
2. minikube ssh -- sudo crictl pull <image>
3. **Permission Issues**:
4. minikube ssh -- sudo chmod 666 /var/run/crio/crio.sock
5. **Runtime Not Starting**:
6. minikube ssh -- sudo systemctl status cri-o

**7. Production Considerations**

**Recommended Runtimes:**

* **On-premises**: containerd (stability)
* **Cloud deployments**: CRI-O (lightweight)
* **Development**: Docker (tooling integration)

**Performance Comparison:**

| **Metric** | **Docker** | **containerd** | **CRI-O** |
| --- | --- | --- | --- |
| Memory Usage | High | Medium | Low |
| Startup Time | Slow | Fast | Fast |
| Compatibility | Broad | Broad | K8s-only |

**8. Reverting to Default Runtime**

minikube delete

minikube start --driver=virtualbox # Defaults to Docker

**9. Advanced Configuration**

**Runtime Configuration Files:**

* **CRI-O**: /etc/crio/crio.conf
* **containerd**: /etc/containerd/config.toml

**View Runtime Logs:**

minikube ssh -- journalctl -u cri-o -f

**10. Final Verification**

**Test Deployment:**

kubectl apply -f k8s-web-to-nginx.yaml

kubectl apply -f nginx.yaml

minikube service k8s-web-to-nginx

This demonstrates Kubernetes' flexibility in supporting multiple container runtimes while maintaining consistent application behavior across all of them.

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- \*\*containerd\*\*

- \*\*CRI-O\*\*

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- Production clusters often use containerd or CRI-O

- Better security profiles

- Reduced resource overhead

- Compliance requirements

## 2. Step-by-Step Runtime Change Process

### 1. Stop and Delete Existing Cluster

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# For CRI-O

minikube start --driver=virtualbox --container-runtime=cri-o

# For containerd

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> \*\*Note:\*\* Avoid Docker driver when changing runtimes as it may cause conflicts.

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### Check Node Components

```bash

minikube ssh -- sudo crictl ps

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Expected output shows containers running under new runtime.

### Runtime-Specific Commands

| Runtime | Command to List Containers |

|------------|----------------------------------|

| Docker | `docker ps` |

| containerd | `sudo ctr containers ls` |

| CRI-O | `sudo crictl ps` |

## 4. Deploying Applications with New Runtime

### No Changes Required!

- Kubernetes abstracts runtime through CRI (Container Runtime Interface)

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### containerd Features:

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## 6. Troubleshooting Runtime Issues

### Common Problems:

1. \*\*Image Pull Failures\*\*:

```bash

minikube ssh -- sudo crictl pull <image>

```

2. \*\*Permission Issues\*\*:

```bash

minikube ssh -- sudo chmod 666 /var/run/crio/crio.sock

```

3. \*\*Runtime Not Starting\*\*:

```bash

minikube ssh -- sudo systemctl status cri-o

```

## 7. Production Considerations

### Recommended Runtimes:

- \*\*On-premises\*\*: containerd (stability)

- \*\*Cloud deployments\*\*: CRI-O (lightweight)

- \*\*Development\*\*: Docker (tooling integration)

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## 8. Reverting to Default Runtime

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minikube start --driver=virtualbox # Defaults to Docker

```

## 9. Advanced Configuration

### Runtime Configuration Files:

- \*\*CRI-O\*\*: `/etc/crio/crio.conf`

- \*\*containerd\*\*: `/etc/containerd/config.toml`

### View Runtime Logs:

```bash

minikube ssh -- journalctl -u cri-o -f

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## 10. Final Verification

### Test Deployment:

```bash

kubectl apply -f k8s-web-to-nginx.yaml

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minikube service k8s-web-to-nginx

```

This demonstrates Kubernetes' flexibility in supporting multiple container runtimes while maintaining consistent application behavior across all of them.