



# CKS Exam

## Experience Topics & Tips



# Who I am

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# CKS Exam

- 100 Marks
- 2 Hours ( **No Count down timer but Progress Indicator**)
- 16 Questions (between 15 - 20)
- v1.23
- Results in **24 hours**
- **No need of**
  - kubectl alias k
  - Bash Auto Completion
  - tmux, curl, wget, yq, jq
- Total of **16 Clusters**
- **Context Switch before every Question**

# CKS In my view



- **Timing is very key \*\*\*\***
- More areas
- Security tools
- Hands on in syllabus and topics
- Modifying Control Plane Components
- Setup, Troubleshooting, Tracing etc
- Linux skills
- Speed Typing does matters (with accuracy)
- Careful with **YAML** Copy/Paste

# Compare with CKA

- **CKA is all about**
  - API - Resources
  - Setup, Install & Backup
- **CKS is covers everything**
  - 4C's
  - Security setup deserves more
  - Tools & utilities
  - Deal with Control Plane
  - Linux skills
  - Sensitive YAML

# Mock Exams

- Kodekloud 3 mock exams – Must do - each exam 4 to 5 times
- AcloudGuru 12 mock exams – Must do - 2 times
- Killer Shell Simulator sessions
  - – **Must do** – until confidence - before the exam
- <https://www.katacoda.com/>
- <https://killercoda.com/>
- <https://labs.play-with-k8s.com/>
- Local vagrant cluster (2 node)
  - <https://github.com/ramanagali/k8s-cluster>

# CKS Exam 1st step



```
echo "set ts=2 sw=2 sts=2 expandtab" > ~/.vimrc
```

# During the exam

- Do not type &&
- Copy paste the names, yaml etc
- Refer bookmarks

# Use Documentation BookMarks



- [!\[\]\(97d7445697a94970d6443da16b12b5fa\_img.jpg\) Kubectl Cheat Sheet](#)
- [!\[\]\(258b828d223cb6b35d2b001cf8c6c1e7\_img.jpg\) Kubectl Commands](#)
- [!\[\]\(3ae3791b31be30fab239cd4ec63dfafe\_img.jpg\) kube-apiserver KubeAPI Configuration](#)
- [!\[\]\(7835479178eea406b1967e30c6fcf845\_img.jpg\) Kubelet Configuration \(v1beta1\)](#)
- [!\[\]\(bacea8e86e4e71bdd65916e2330bb152\_img.jpg\) KubeConfig](#)
- [!\[\]\(103e1d41c49e54d33b8438f1f22779e7\_img.jpg\) Install and Verify Binaries](#)
- [!\[\]\(127f84612f2d3af1475c40eb1d227d82\_img.jpg\) Ingress with TLS](#)
- [!\[\]\(bd481c0ca3cf419dd12c334e7c6134ef\_img.jpg\) NetworkPolicy NetPol](#)
- [!\[\]\(4bad89d7f2d54a9dd8d439405672b516\_img.jpg\) Role RoleBinding Commands CLI RBAC](#)
- [!\[\]\(ca5efa1fd99f0257579e9142bacd2556\_img.jpg\) POD volumemount \[hostPath\]](#)
- [!\[\]\(aa9ef994bed7fa38b15a4e5e70bf6ae9\_img.jpg\) PSP PodSecurityPolicy](#)
- [!\[\]\(74566d81d00a0219b912a74e95a75e40\_img.jpg\) Seccomp](#)
- [!\[\]\(943144c6978039e9c05c786b37ec3129\_img.jpg\) AppArmor](#)
- [!\[\]\(9d3999dbe4ca37ffcfab8efdd4c45b35\_img.jpg\) AppArmor Docs - GitLab](#)
- [!\[\]\(5ae02fd6274c2483590d6012e3d04afa\_img.jpg\) Security Context](#)
- [!\[\]\(e5570f5f748ac88f4e736b3266532731\_img.jpg\) ServiceAccount automountServiceAccountTo...](#)
- [!\[\]\(87b4db5879b0730071a0d46329036123\_img.jpg\) Decode Secret](#)
- [!\[\]\(b08001ae99ef206fa4f9af57f20865f1\_img.jpg\) Secret Types](#)
- [!\[\]\(854c302f4c2b1fa304f37352e1f6040c\_img.jpg\) Secret as VolumeMount](#)
- [!\[\]\(db2e055846185a85e7727455d0ebb2c6\_img.jpg\) Image Policy Webhook - IPW](#)
- [!\[\]\(f94e2b1e8b460412680111ec8ab42956\_img.jpg\) Audit Policy](#)
- [!\[\]\(e1994e58386436a56e274b4794576284\_img.jpg\) RuntimeClass](#)
- [!\[\]\(c297745f2265c49f12f422c1d0e3faf3\_img.jpg\) Runtime Class Examples - GitHub](#)
- [!\[\]\(88ebdcdd4a6cf8af176ba422814aa6a7\_img.jpg\) Pod Level Logging with Kubernetes](#)
- [!\[\]\(78d629f5c51fa974fa2b686e68b5e10a\_img.jpg\) Trivy Examples](#)
- [!\[\]\(79d1eb3b4ad4722eca75d35d916a40b9\_img.jpg\) Trivy - GitHub](#)
- [!\[\]\(ea49966dec3db5f47646d404956733d2\_img.jpg\) Falco Supported Conditions Outputs](#)
- [!\[\]\(aac249bef4c11a70843828fb0e5ba317\_img.jpg\) FALCO: default rules](#)
- [!\[\]\(ecf7706a2c8cac479935df99b83367a2\_img.jpg\) Examples](#)
- [!\[\]\(c7bd4a450cb0cd714108d844e86a4c8a\_img.jpg\) K8S Binaries and Release Notes - GitHub](#)
- [!\[\]\(4d41dd10235d2e3427042e475a7dc346\_img.jpg\) crioctl](#)
- [!\[\]\(a7fc99238206aecc8f2525aa42d56d25\_img.jpg\) Access API Server on Two Ports](#)

# CKS Exam Categories



- 1. Control Plane related (API Server, etcd, kubelet etc)**
- 2. General Kubernetes (Resources)**

# Control Plane related



- 1. CIS Benchmarking**
- 2. PodSecurityPolicy**
- 3. ImagePolicyWebhook/AdmissionController**
- 4. AuditPolicy**
- 5. Falco/Sysdig**
- 6. Tracing Container syscall**
- 7. Hardening access to Kubernetes API**
- 8. Troubleshoot API Server**

# General Resource Related

1. NetworkPolicy
2. RBAC
3. Secret
4. ServiceAccount
5. AppArmor
6. SecComp
7. RuntimeClass
8. SecurityContext & Immutable Pods
9. Static Analysis
10. Trivy
11. Ingress TLS
12. OPA

# 1. CIS Benchmarking

- Given CIS Benchmark Scan results
- Fix based on its remediations (displayed along with result)
- Control Plane Component(s) issues
- Kubelet Config issues etc

Refer: <https://downloads.cisecurity.org/#/>



## 2. PodSecurityPolicy

```

apiVersion: policy/v1beta1
kind: PodSecurityPolicy
metadata:
  name: example
spec:
  privileged: false # Don't allow privileged pods!
  # The rest fills in some required fields.
  seLinux:
    rule: RunAsAny
  supplementalGroups:
    rule: RunAsAny
  runAsUser:
    rule: RunAsAny
  fsGroup:
    rule: RunAsAny
  volumes:
    - '*'

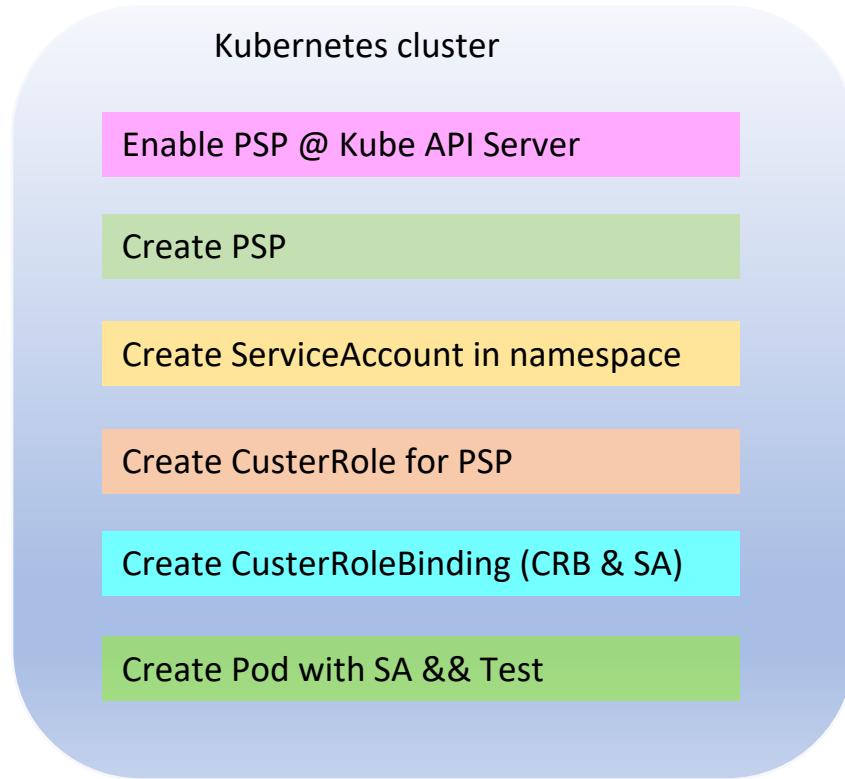
```

```

apiVersion: policy/v1beta1
kind: PodSecurityPolicy
metadata:
  name: privileged
  annotations:
    seccomp.security.alpha.kubernetes.io/allowedProfileNames: '*'
spec:
  privileged: true
  allowPrivilegeEscalation: true
  allowedCapabilities:
    - '*'
  volumes:
    - '*'
  hostNetwork: true
  hostPorts:
    - min: 0
      max: 65535
  hostIPC: true
  hostPID: true
  runAsUser:
    rule: 'RunAsAny'
  seLinux:
    rule: 'RunAsAny'
  supplementalGroups:
    rule: 'RunAsAny'
  fsGroup:
    rule: 'RunAsAny'

```

# 2. PodSecurityPolicy Implementation



Kube-API-Server level...

**--enable-admission-plugins**=NodeRestriction, **PodSecurityPolicy**

# 3. ImagePolicyWebhook

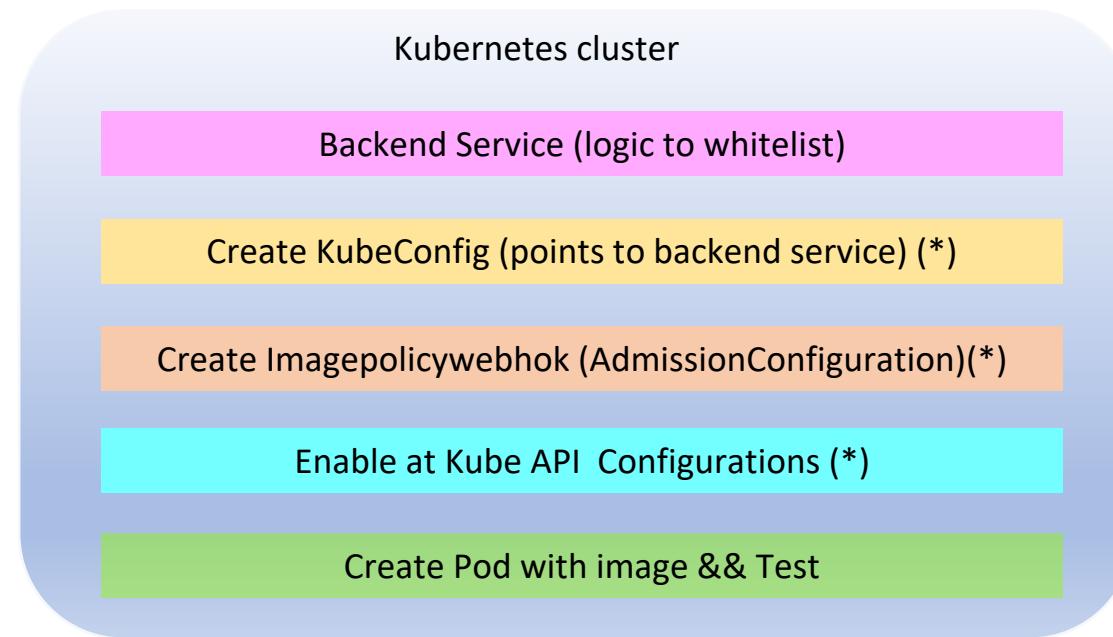
## /etc/kubernetes/xyz/admission\_kube\_config.json

```
{
  "imagePolicy": {
    "kubeConfigFile": "/etc/kubernetes/pki/webhook/admission_kube_config.yaml",
    "allowTTL": 50,
    "denyTTL": 50,
    "retryBackoff": 500,
    "defaultAllow": false
  }
}
```

```
apiVersion: apiserver.config.k8s.io/v1
kind: AdmissionConfiguration
plugins:
- name: ImagePolicyWebhook
  configuration:
    imagePolicy:
      kubeConfigFile: <path-to-kubeconfig-file>
      allowTTL: 50
      denyTTL: 50
      retryBackoff: 500
      defaultAllow: true
```

```
        apiVersion: v1
        kind: Config
        clusters:
        - cluster:
          certificate-authority: /etc/kubernetes/pki/server.crt
          server: https://image-bouncer-webhook:30080/image_policy
          name: bouncer_webhook
        contexts:
        - context:
          cluster: bouncer_webhook
          user: api-server
          name: bouncer_validator
        current-context: bouncer_validator
        preferences: {}
        users:
        - name: api-server
          user:
            client-certificate: /etc/kubernetes/pki/apiserver.crt
            client-key: /etc/kubernetes/pki/apiserver.key
```

# 3. ImagePolicyWebhook Implementation



- Kube-APIServer level...

```
- --enable-admission-plugins=NodeRestriction,ImagePolicyWebhook
- --admission-control-config-file
    =/etc/kubernetes/xyz/admission_configuration.json
```

# 4. Audit Policy

- YAML File to capture events of API Calls

```

apiVersion: audit.k8s.io/v1 # This is required.
kind: Policy
rules:
  # Log all ConfigMap and Secret changes at the Metadata level
  - level: Metadata
    resources:
      - group: ""
        resources: ["secrets", "configmaps"]
    namespaces: ["prod"]

apiVersion: audit.k8s.io/v1 # This is required.
kind: Policy
# Don't generate audit events for all requests
# in RequestReceived stage.
omitStages:
  - "RequestReceived"
rules:
  # Log pod changes at RequestResponse level
  - level: RequestResponse
    resources:
      - group: ""
        # Resource "pods" doesn't match requests
        # to any subresource of pods,
        # which is consistent with the RBAC policy.
        resources: ["pods"]

```

```

apiVersion: audit.k8s.io/v1 # This is required.
kind: Policy
rules:
  # Log the request body of configmap changes in kube-system.
  - level: Request
    verbs: ["get", "create", "update", "watch", "delete", "list"]
    resources:
      - group: "" # core API group
        resources: ["configmaps"]
    namespaces: ["kube-system"]

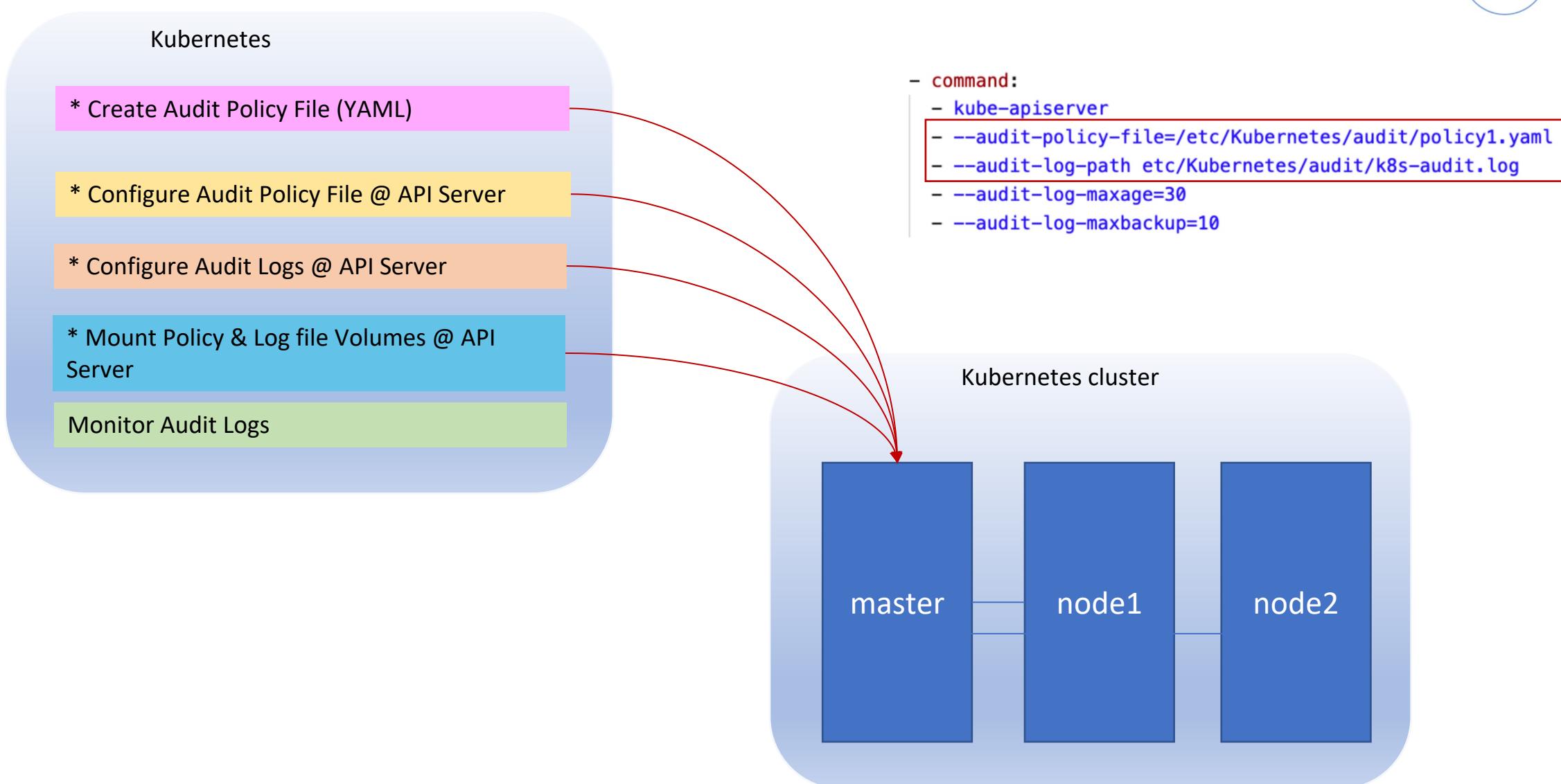
  # This rule only applies to resources in the "kube-system" namespace.
  # The empty string "" can be used to select non-namespaced resources.
  namespaces: ["kube-system"]

apiVersion: audit.k8s.io/v1 # This is required.
kind: Policy
rules:
  # Don't log requests to a configmap called "test-configmap"
  - level: None
    resources:
      - group: ""
        resources: ["configmaps"]
        resourceNames: ["test-configmap"]

  # Don't log watch requests by the "system:kube-proxy" on endpoints
  - level: None
    users: ["system:kube-proxy"]
    verbs: ["watch"]
    resources:
      - group: "" # core API group
        resources: ["endpoints", "services"]

```

# 4. Audit Policy Implementation



# 5. Falco Rules

## Falco Rule – YAML file

- **Default rules file**, installed at `/etc/falco/falco_rules.yaml`
- **Local rules file**, installed at `/etc/falco/falco_rules.local.yaml`
  - Update falco config `/etc/falco/falco.yaml` & restart falco

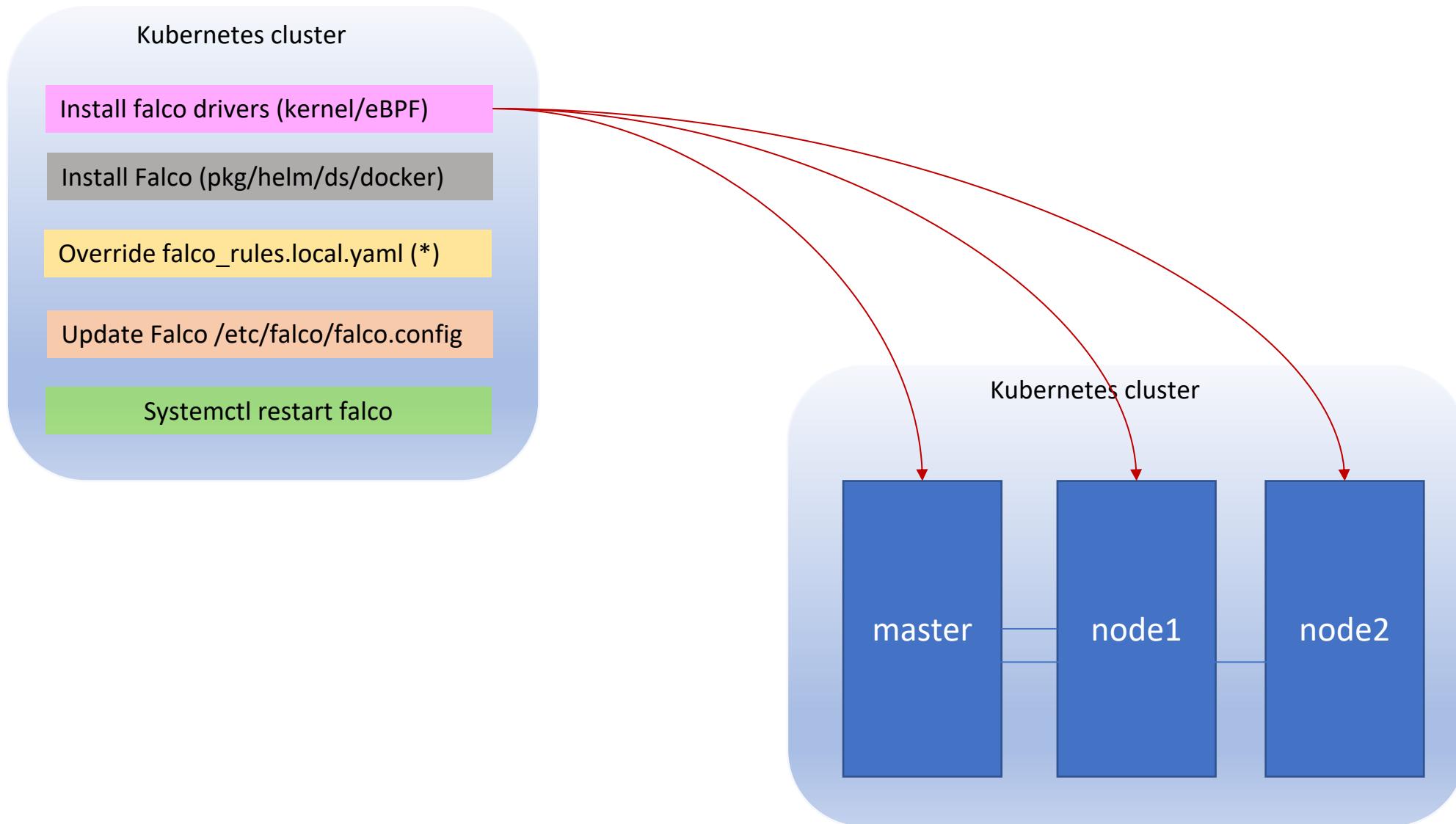
**Priority:** EMERGENCY/ALERT/CRITICAL/ERROR/WARNING/NOTICE/INFO/DEBUG

```
- macro: container
  condition: container.id != host

- macro: spawned_process
  condition: evt.type = execve and evt.dir=<

- rule: run_shell_in_container
  desc: a shell was spawned by a non-shell program in a container. Container entrypoints are excluded.
  condition: container and proc.name = bash and spawned_process and proc.pname exists and not proc.pname i
  output: "Shell spawned in a container other than entrypoint (user=%user.name container_id=%container.id"
  priority: WARNING
```

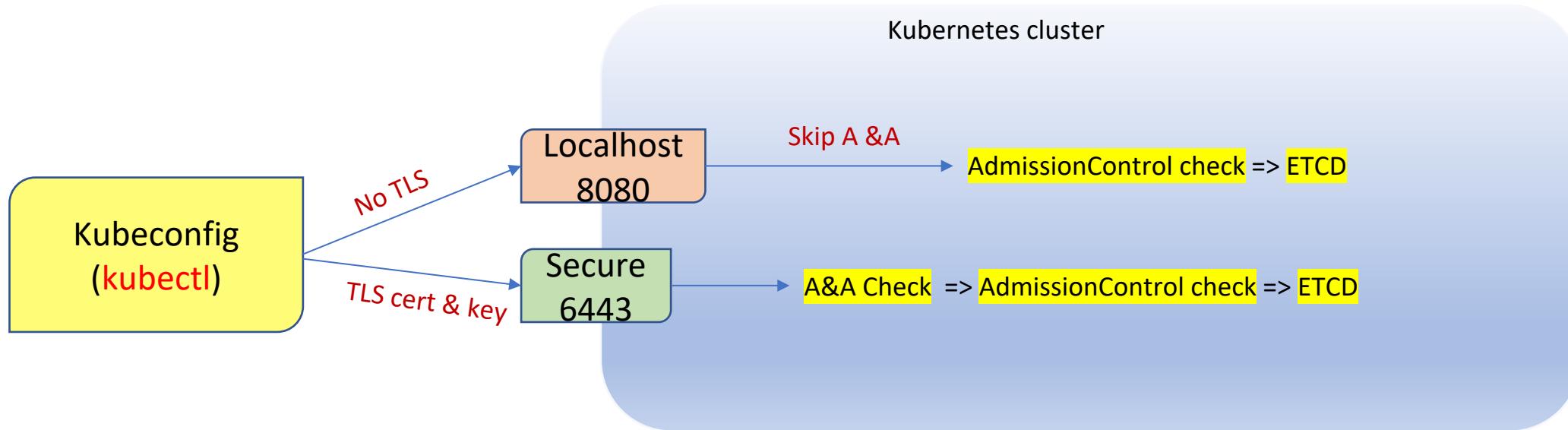
# 5. Falco Implementation



# 6. Tracing Containers

- `crictl ps -a`
- `crictl ps -id 123456789`
- `crictl inspect 123456789 | grep -i profile`
- `crictl inspect 123456789 | grep args -A2 -B2`
  
- `crictl pods --name pod1`
- `crictl pods -id 595af943c3245`
- `crictl pods | grep apparmor`
- `crictl ps --pod 21aacb8f4ca8d`
- `watch crictl ps`
  
- `ps aux | grep xyzprocess1.` (find PID)
- `strace -p 123` (find using strace)

# 7. Secure Kubernetes API Server



- **localhost** – default IP can be change with `--insecure-bind-address`
- **Secure** – default Port is **6443**, change with `--secure-port`
- **Secure** – set TLS certificate with `--tls-cert-file`
- **Secure** – set TLS certificate key with `--tls-private-key-file` flag

# 7. Disable Anonymous requests to API

- API Server level `--anonymous-auth=true` If its enabled...
- Other than API authentication methods are treated as anonymous requests
- ABAC and RBAC authorizers requires explicit
  - auth of `system:anonymous` user
  - `system:unauthenticated` group

```
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRole
metadata:
  name: anonymous-review-access
rules:
- apiGroups:
  - authorization.k8s.io
  resources:
  - selfsubjectaccessreviews
  - selfsubjectrulesreviews
  verbs:
  - create
```

```
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRoleBinding
metadata:
  name: anonymous-review-access
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: ClusterRole
  name: anonymous-review-access
subjects:
- kind: User
  name: system:anonymous
  namespace: default
```



# 8. Troubleshoot if API Server down

SSH Master Node...

```
cd /var/log/pods/
```

```
ls -l
```

```
cd kube-system_kube-apiserver-controlplane_xxx/kube-apiserver
```

```
tail -f 1.log
```

# General Resource Related

1. NetworkPolicy
2. RBAC
3. Secret
4. ServiceAccount
5. AppArmor
6. SecComp
7. RuntimeClass
8. SecurityContext & Immutable Pods
9. Static Analysis
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# 1. Network Policy YAML

```

1  apiVersion: networking.k8s.io/v1
2  kind: NetworkPolicy
3  metadata:
4    name: test-network-policy
5    namespace: default
6  spec:
7    podSelector:
8      matchLabels:
9        role: db
10   policyTypes:
11     - Ingress
12     - Egress
13   ingress:
14     - from:
15       - ipBlock:
16         cidr: 172.17.0.0/16
17         except:
18           - 172.17.1.0/24
19       - namespaceSelector:
20         matchLabels:
21           project: myproject
22       - podSelector:
23         matchLabels:
24           role: frontend
25     ports:
26       - protocol: TCP
27         port: 6379
28   egress:
29     - to:
30       - ipBlock:
31         cidr: 10.0.0.0/24
32     ports:
33       - protocol: TCP
34         port: 5978

```

**Name** of the NetworkPolicy & applicable Domain

**Target Pod:** To **which Pod** you want to apply this ?

**What type of Policy** ? Incoming & Outgoing of above Pod

**From where** you want to allow? If its blank then Deny all

**From which** CIDR you want to allow?

**Except** which CIDR (filter) ?

**From what** Namespace you want to allow ?

**From which Pod** you want to allow traffic?

**Incoming Policy on what Port** of Pod?

**To where** you want to allow outgoing? If its blank then Deny all

**To which CIDR** you want to allow outgoing?

**Outgoing Policy on what Port** of Pod?

**IMPORTANT:** if YAML is specified as...  
 > List then OR condition  
 > If not then AND condition

## 2. RBAC

```

apiVersion: rbac.authorization.k8s.io/v1
kind: Role
metadata:
  namespace: default
  name: configmap-updater
rules:
- apiGroups: [""]
  #
  # at the HTTP level, the name of the resource objects is "configmaps"
  resources: ["configmaps"]
  resourceNames: ["my-configmap"]
  verbs: ["update", "get"]

```

```

apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRole
metadata:
  # "namespace" omitted since ClusterRoles are not namespaced
  name: secret-reader
rules:
- apiGroups: [""]
  #
  # at the HTTP level, the name of the resource for accessing Secret
  # objects is "secrets"
  resources: ["secrets"]
  verbs: ["get", "watch", "list"]

```

```

apiVersion: rbac.authorization.k8s.io/v1
# This role binding allows "jane" to read pods
# You need to already have a Role named "pod-reader"
kind: RoleBinding
metadata:
  name: read-pods
  namespace: default
subjects:
# You can specify more than one "subject"
- kind: User
  name: jane # "name" is case sensitive
  apiGroup: rbac.authorization.k8s.io
roleRef:
# "roleRef" specifies the binding to a Role
kind: Role #this must be Role or ClusterRole
name: pod-reader # this must match the name of the Role
apiGroup: rbac.authorization.k8s.io

```

```

apiVersion: rbac.authorization.k8s.io/v1
# This cluster role binding allows anyone in the "manager" group
# to read secrets
kind: ClusterRoleBinding
metadata:
  name: read-secrets-global
subjects:
- kind: Group
  name: manager # Name is case sensitive
  apiGroup: rbac.authorization.k8s.io
roleRef:
  kind: ClusterRole
  name: secret-reader
  apiGroup: rbac.authorization.k8s.io

```

# RBAC Commands

```
Kubectl create ns test
```

```
Kubectl create sa svc-user1 -n test
```

```
Kubectl create role creator-role -n test --  
verb=create --resource=secret --resource=configmap
```

```
Kubectl create rolebinding creator-binding -n test  
--role creator-role --serviceaccount test:svc-  
user1
```

```
Kubectl auth can-i create secret -n test --as  
system:serviceaccount:test:svc-user1
```

# 3. Secrets as environment variables

```
apiVersion: v1
kind: Secret
metadata:
  name: mysecret
type: Opaque
data:
  USER_NAME: YWRtaW4=
  PASSWORD: MjAyMzEwMjMxNjUy
```

```
apiVersion: v1
kind: Pod
metadata:
  name: secret-env-pod
spec:
  containers:
  - name: mycontainer
    image: redis
    env:
      - name: SECRET_USERNAME
        valueFrom:
          secretKeyRef:
            name: mysecret
            key: username
      - name: SECRET_PASSWORD
        valueFrom:
          secretKeyRef:
            name: mysecret
            key: password
  restartPolicy: Never
```

# 3. Secrets as Volumemount

```
kubectl create secret generic ssh-key-secret --from-file=ssh-privatekey=/path/to/.ssh/id_rsa --from-file=ssh-publickey=/path/to/.ssh/id_rsa.pub
```

```
apiVersion: v1
kind: Pod
metadata:
  name: secret-test-pod
  labels:
    name: secret-test
spec:
  volumes:
  - name: secret-volume
    secret:
      secretName: ssh-key-secret
  containers:
  - name: ssh-test-container
    image: mySshImage
    volumeMounts:
    - name: secret-volume
      readOnly: true
      mountPath: "/etc/secret-volume"
```

/etc/secret-volume/ssh-publickey  
/etc/secret-volume/ssh-privatekey

# 3. Decode Secret using base64

```
kubectl create secret generic db-user-pass \  
  --from-literal=username=devuser \  
  --from-literal=password='S!B\*d$zDsb='
```

```
kubectl describe secrets/db-user-pass
```

```
Name:          db-user-pass  
Namespace:    default  
Labels:        <none>  
Annotations:   <none>  
  
Type:          Opaque  
  
Data  
====
```

```
password:     12 bytes  
username:     5 bytes
```

```
kubectl get secret db-user-pass -o jsonpath='{.data}'  
  
{"password":"MwYyZDFlMmU2N2Rm", "username":"YWRtaW4="}
```

```
echo 'MwYyZDFlMmU2N2Rm' | base64 --decode
```

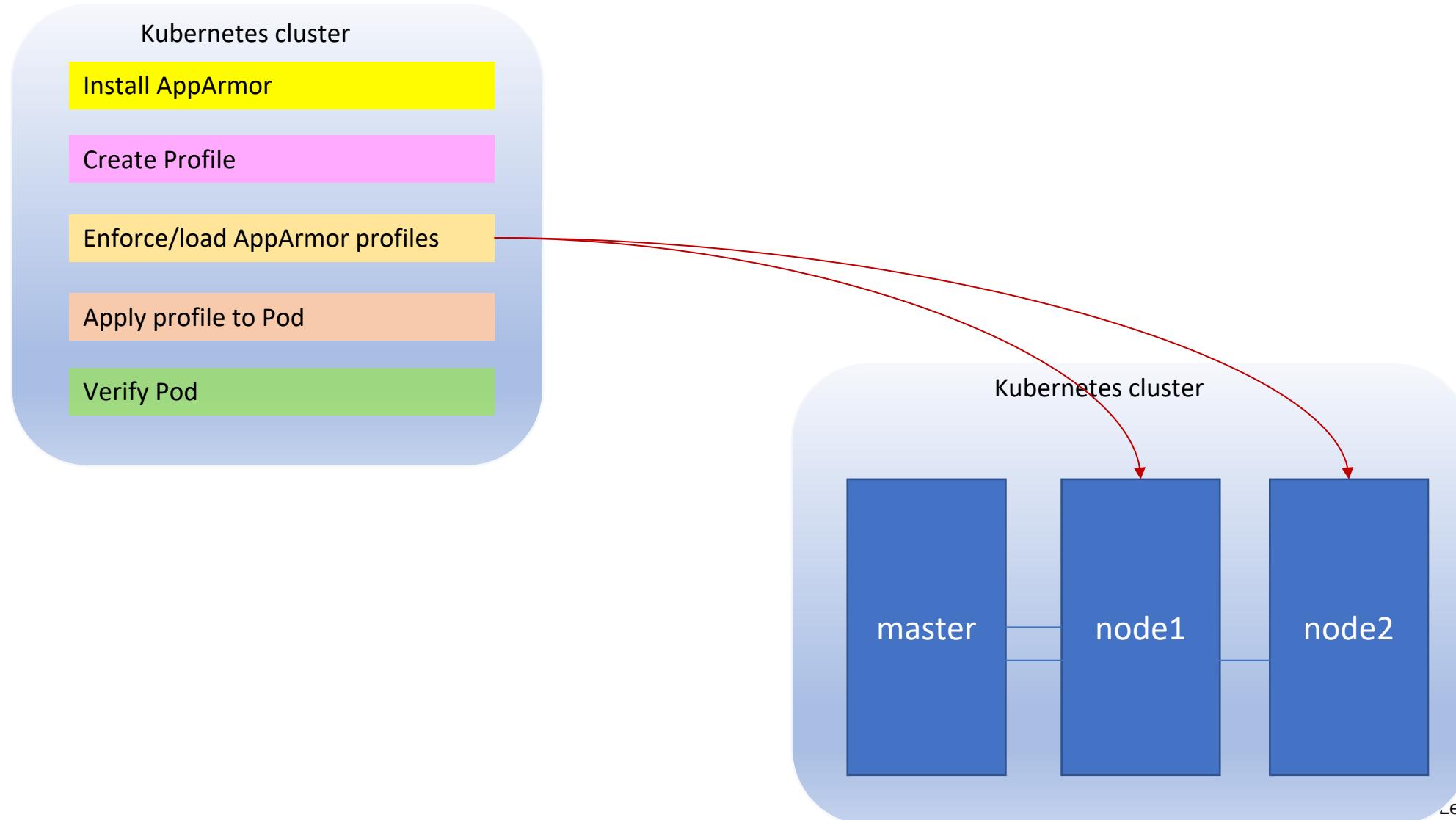
```
1f2d1e2e67df
```

# 4. ServiceAccount AutoMount

```
apiVersion: v1
kind: ServiceAccount
metadata:
  name: test-svc
  namespace: dev
automountServiceAccountToken: false
```

```
apiVersion: v1
kind: Pod
metadata:
  name: web
  namespace: dev
spec:
  containers:
  - image: web
    name: web
  serviceAccountName: test-svc
  automountServiceAccountToken: false
```

# 5. AppArmor Implementation



# 5. AppArmor Profile & Apply to Pod

```
#include <tunables/global>

profile k8s-apparmor-example-deny-write flags=(attach_disconnected) {
    #include <abstractions/base>

    file,
    # Deny all file writes.
    deny /** w,
}
```

```
apparmor_parser /given/path/file
aa-status | grep profile_name
```

```
apiVersion: v1
kind: Pod
metadata:
  name: hello-apparmor-2
annotations:
  container.apparmor.security.beta.kubernetes.io/hello: localhost/k8s-apparmor-example-allow-write
spec:
  containers:
  - name: hello
    image: busybox
    command: [ "sh", "-c", "echo 'Hello AppArmor!' && sleep 1h" ]
```

# 6. SecComp Profiles

[audit.json](#) [violation.json](#)

[fine-grained.json](#)

```
{
  "defaultAction": "SCMP_ACT_ERRNO",
  "architectures": [
    "SCMP_ARCH_X86_64",
    "SCMP_ARCH_X86",
    "SCMP_ARCH_X32"
  ],
  "syscalls": [
    {
      "names": [
        "accept4",
        "epoll_wait",
        "recvfrom",
        "sendto",
        "set_tid_address",
        "setitimer",
        "writev"
      ],
      "action": "SCMP_ACT_ALLOW"
    }
  ]
}
```

```

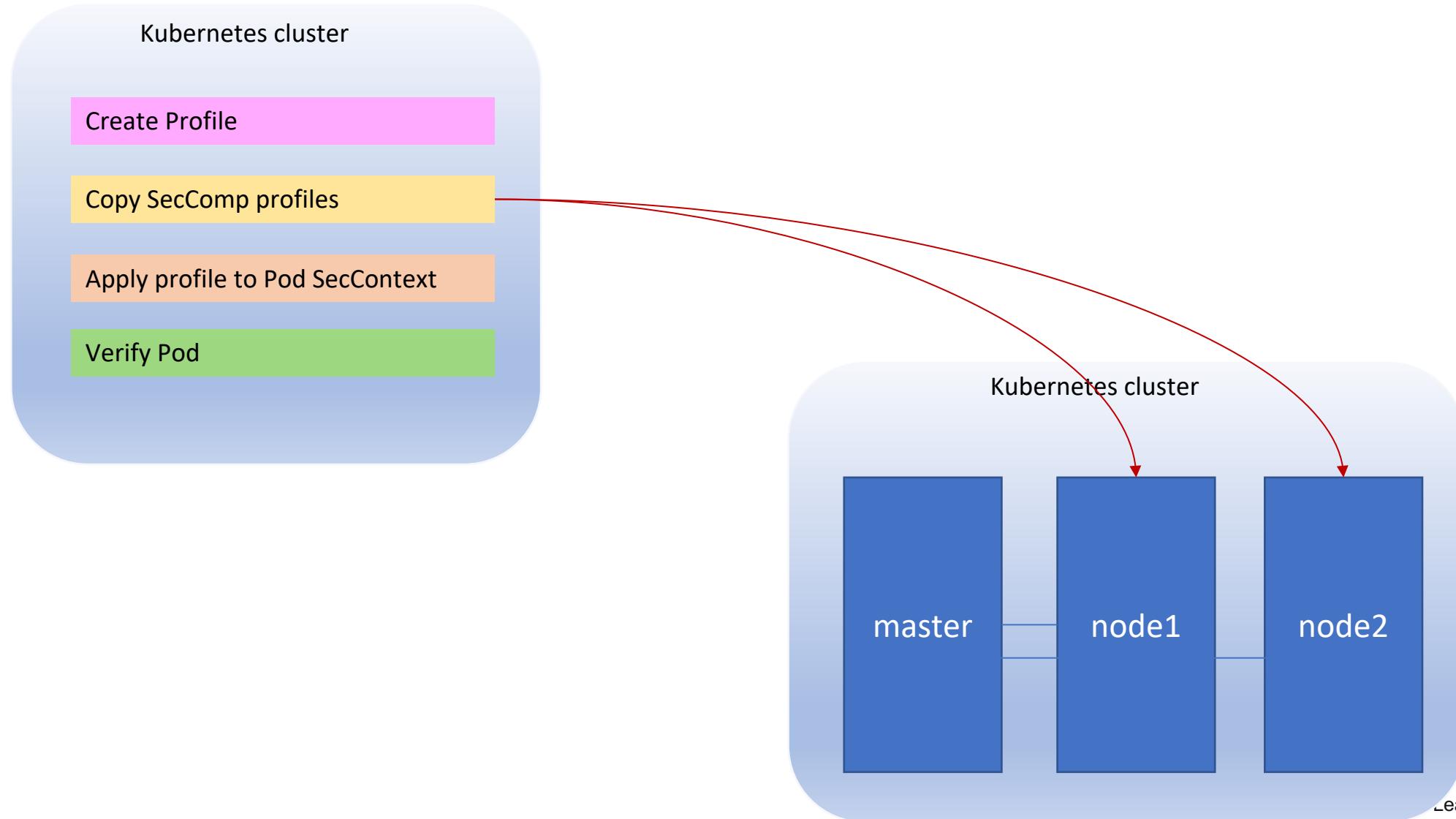
apiVersion: v1
kind: Pod
metadata:
  name: fine-pod
  labels:
    app: fine-pod
spec:
  securityContext:
    seccompProfile:
      type: Localhost
      localhostProfile: profiles/fine-grained.json
  containers:
    - name: test-container
      image: hashicorp/http-echo:0.2.3
      args:
        - "-text=just made some syscalls!"
  securityContext:
    allowPrivilegeEscalation: false

```

Profiles should be placed at

**/var/lib/kubelet/seccomp/profiles/fine-grained.json**

# 6. SecComp Implementation



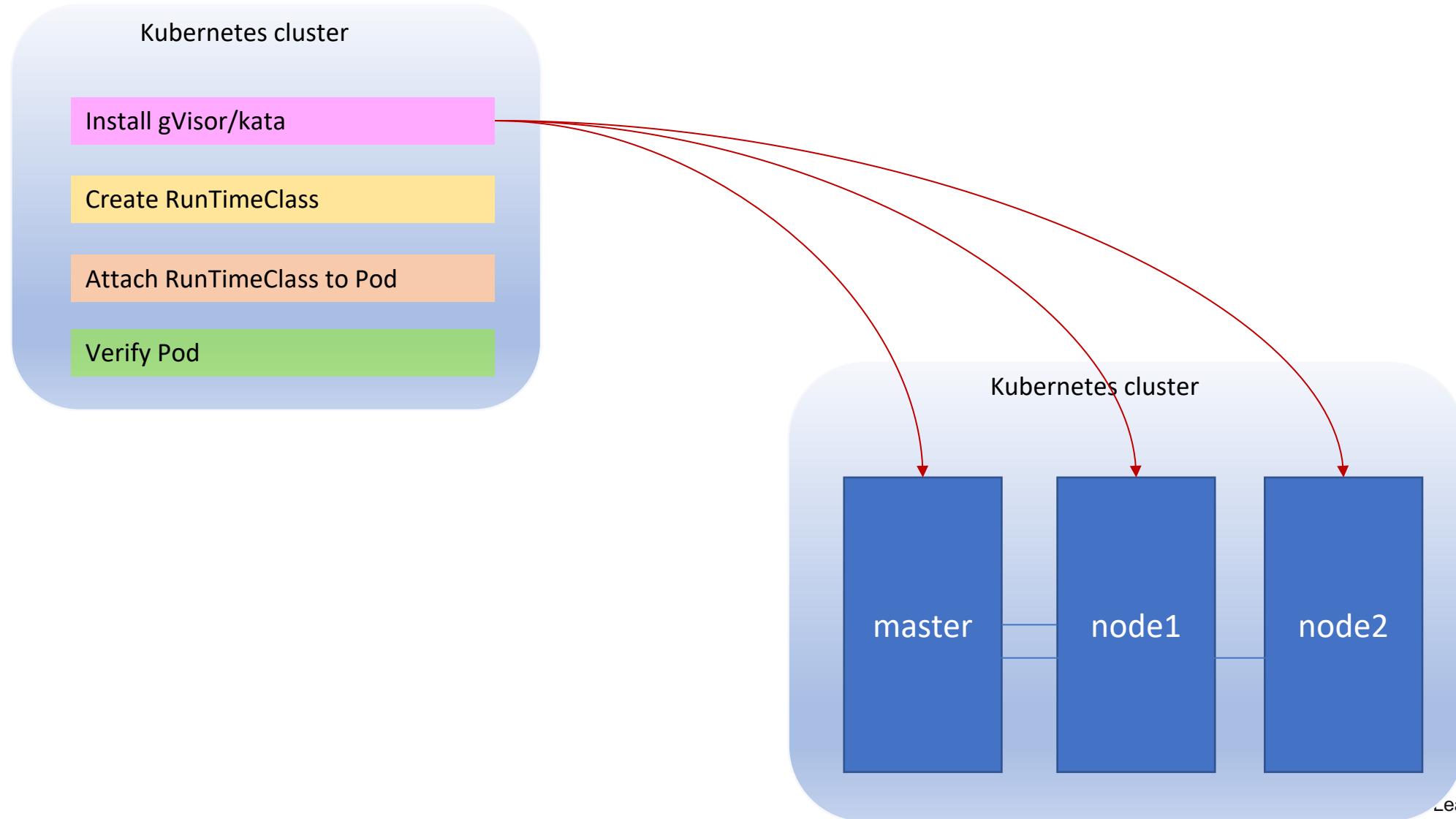
# 7. RuntimeClass

```
apiVersion: node.k8s.io/v1
kind: RuntimeClass
metadata:
  name: myclass # The name
handler: runsc # non-namespaced
```

```
apiVersion: node.k8s.io/v1
kind: RuntimeClass
metadata:
  name: myclass # The name
handler: kata # non-namespaced
```

```
apiVersion: v1
kind: Pod
metadata:
  name: mypod
spec:
  runtimeClassName: myclass
  containers:
    - image: busybox
      name: busybox
      command: ['sh', '-c', 'while true; do echo
```

# 7. RuntimeClass Implementation



# 8. SecurityContext @ Pod level

```
apiVersion: v1
kind: Pod
metadata:
  name: security-context-demo
spec:
  securityContext:
    runAsUser: 1000
    runAsGroup: 3000
    fsGroup: 2000
  volumes:
  - name: sec-ctx-vol
    emptyDir: {}
  containers:
  - name: sec-ctx-demo
    image: busybox
    command: [ "sh", "-c", "sleep 1h" ]
    volumeMounts:
    - name: sec-ctx-vol
      mountPath: /data/demo
    securityContext:
      allowPrivilegeEscalation: false
```

# Security Context @ Container Level

```
apiVersion: v1
kind: Pod
metadata:
  name: security-context-demo-2
spec:
  securityContext:
    runAsUser: 1000
  containers:
  - name: sec-ctx-demo-2
    image: gcr.io/google-samples/node-hello:1.0
    securityContext:
      runAsUser: 2000
      allowPrivilegeEscalation: false
```

```
apiVersion: v1
kind: Pod
metadata:
  name: security-context-demo-4
spec:
  containers:
  - name: sec-ctx-4
    image: gcr.io/google-samples/node-hello:1.0
    securityContext:
      capabilities:
        add: ["NET_ADMIN", "SYS_TIME"]
```

# Seccomp/seLinux for a Container

```
apiVersion: v1
kind: Pod
metadata:
  name: security-context-demo-4
spec:
  containers:
    - name: sec-ctx-4
      image: gcr.io/google-samples/node-hello:1.0
      securityContext:
        capabilities:
          add: ["NET_ADMIN", "SYS_TIME"]
```

```
...
  securityContext:
    seccompProfile:
      type: RuntimeDefault
```

```
...
  securityContext:
    seccompProfile:
      type: Localhost
      localhostProfile: my-profiles/profile-allow.json
```

```
...
  securityContext:
    seLinuxOptions:
      level: "s0:c123,c456"
```

## 8.2. Immutable Pods

```

apiVersion: apps/v1
kind: Deployment
metadata:
  name: non-legitimate-deploy
spec:
  replicas: 1
  selector:
    matchLabels:
      app: non-legitimate-deploy
  template:
    metadata:
      labels:
        app: non-legitimate-deploy
    spec:
      hostIPC: true
      hostNetwork: true
      hostPID: true
      containers:
        - name: nginx
          image: nginx:latest
          ports:
            - containerPort: 80
      securityContext:
        privileged: true
        runAsUser: 0
        allowPrivilegeEscalation: true
        readOnlyRootFilesystem: true
        capabilities:
          add: ["CAP_SYS_BOOT"]

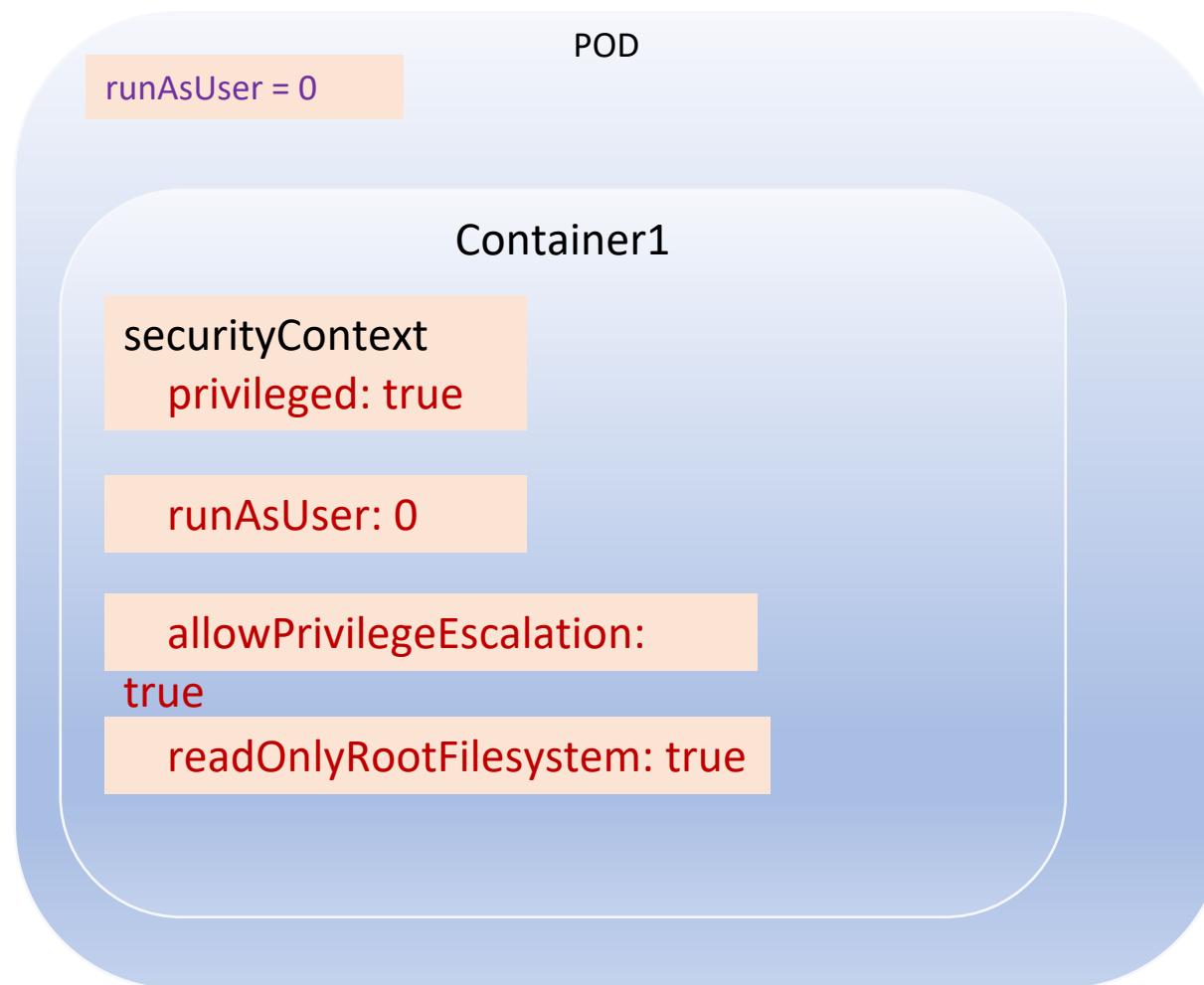
```

```

apiVersion: v1
kind: Pod
metadata:
  name: security-context-demo
spec:
  volumes:
    - name: sec-ctx-vol
      emptyDir: {}
  containers:
    - name: sec-ctx-demo
      image: busybox
      command: [ "sh", "-c", "echo hello > /data/demo/hello.txt; sleep 1h" ]
  securityContext:
    privileged: true
    runAsUser: 0
    allowPrivilegeEscalation: true
    readOnlyRootFilesystem: false
  volumeMounts:
    - name: sec-ctx-vol
      mountPath: /data/demo

```

# Immutability - Avoid Elevated Privileges



# 9. Static Analysis (Manual)

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: non-legitimate-deploy
spec:
  replicas: 1
  selector:
    matchLabels:
      app: non-legitimate-deploy
  template:
    metadata:
      labels:
        app: non-legitimate-deploy
    spec:
      hostIPC: true
      hostNetwork: true
      hostPID: true
      containers:
        - name: nginx
          image: nginx:latest
          ports:
            - containerPort: 80
          securityContext:
            privileged: true
            runAsUser: 0
            allowPrivilegeEscalation: true
            readOnlyRootFilesystem: true
            capabilities:
              add: ["CAP_SYS_BOOT"]
FROM fedora:29
RUN groupadd -r swuser -g 433 && \
    useradd -u 431 -r -g swuser -s /sbin/nologin -c "Docker image user" swuser
USER root
RUN dnf install -y vim
USER swuser
ENV USER_NAME="bob"
ENV PASSWORD="abcd123"
```

# 10. Trivy Scan



```
trivy image -s HIGH,CRITICAL python:3.4-alpine | grep -i total
```

```
Total: 37 (UNKNOWN: 0, LOW: 4, MEDIUM: 16, HIGH: 13, CRITICAL: 4)
```

# Practice ... Practice... Practice...

# All the Best & Good Luck