Kubernetes Security

Reliability

Kubernetes Security

Open Policies Agent - OPA

Vault

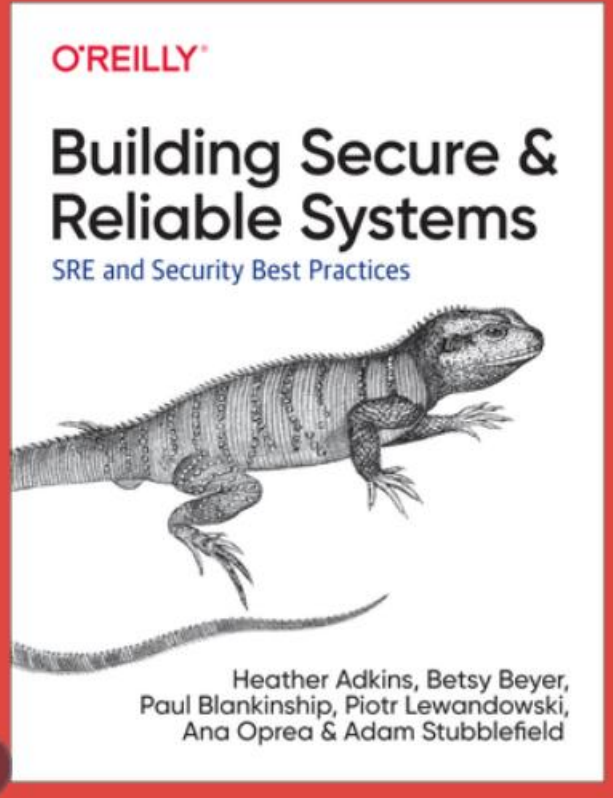
Network Policies

Admission Controllers

Bruno S. Brasil

System Engineer / SRE

Reliability



SRE Hierarchy

IT Security

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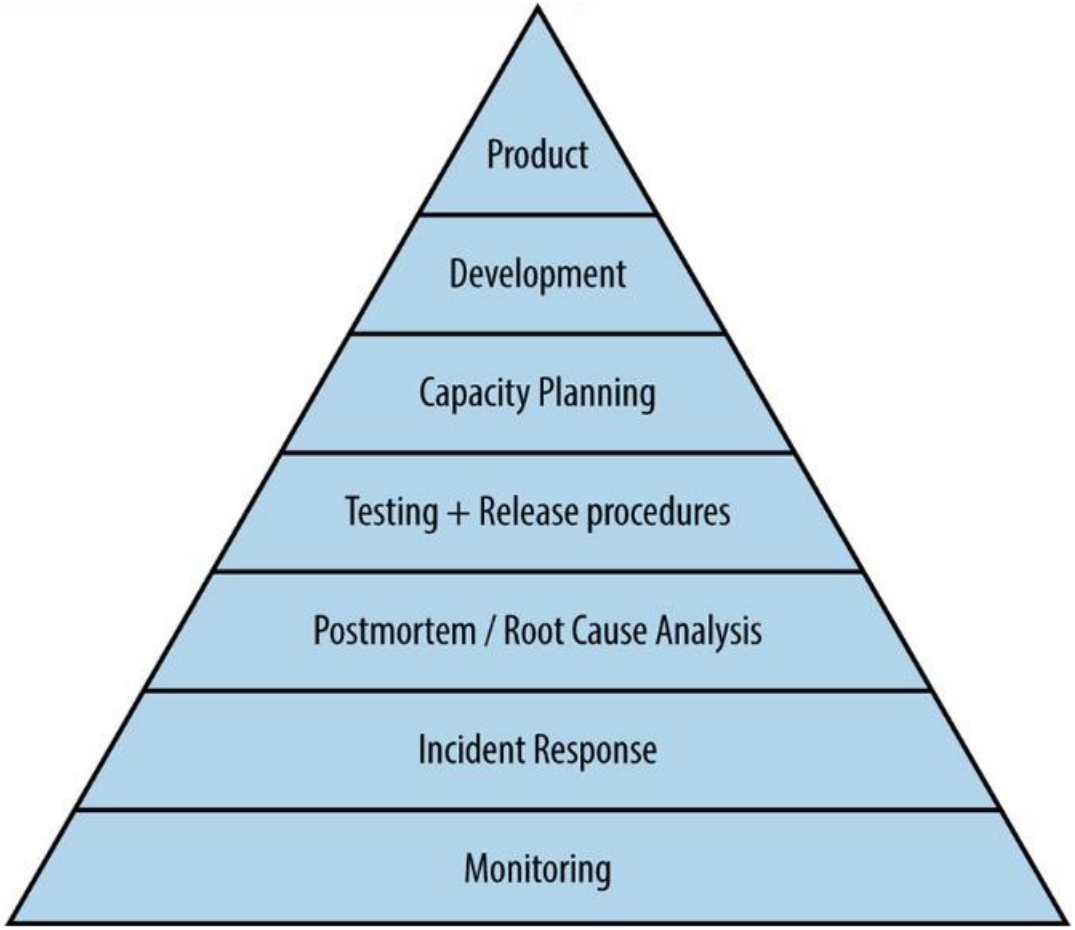
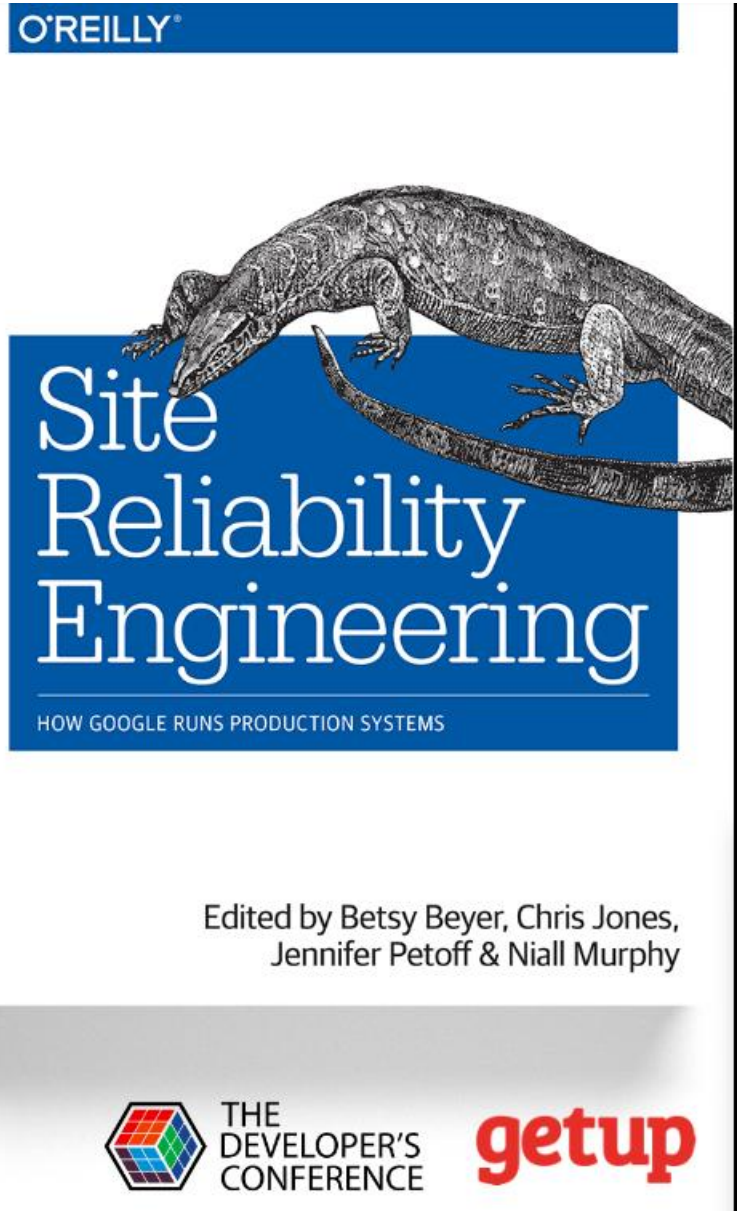
SRE Hierarchy





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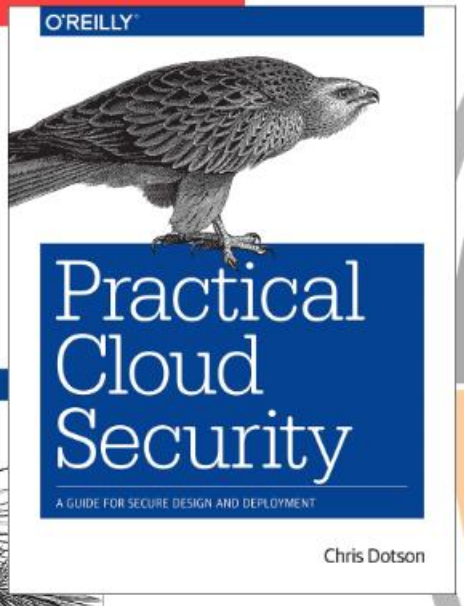
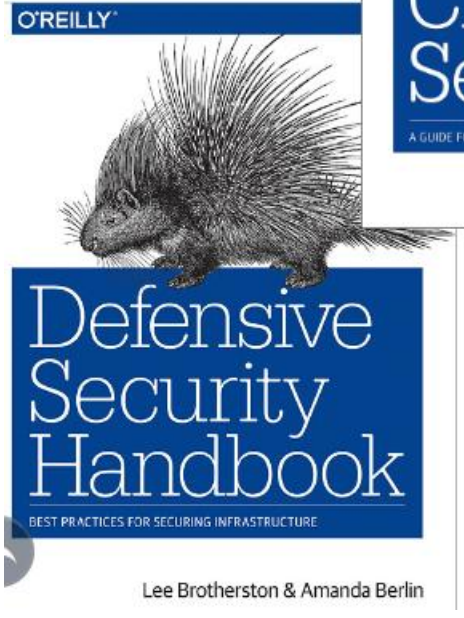
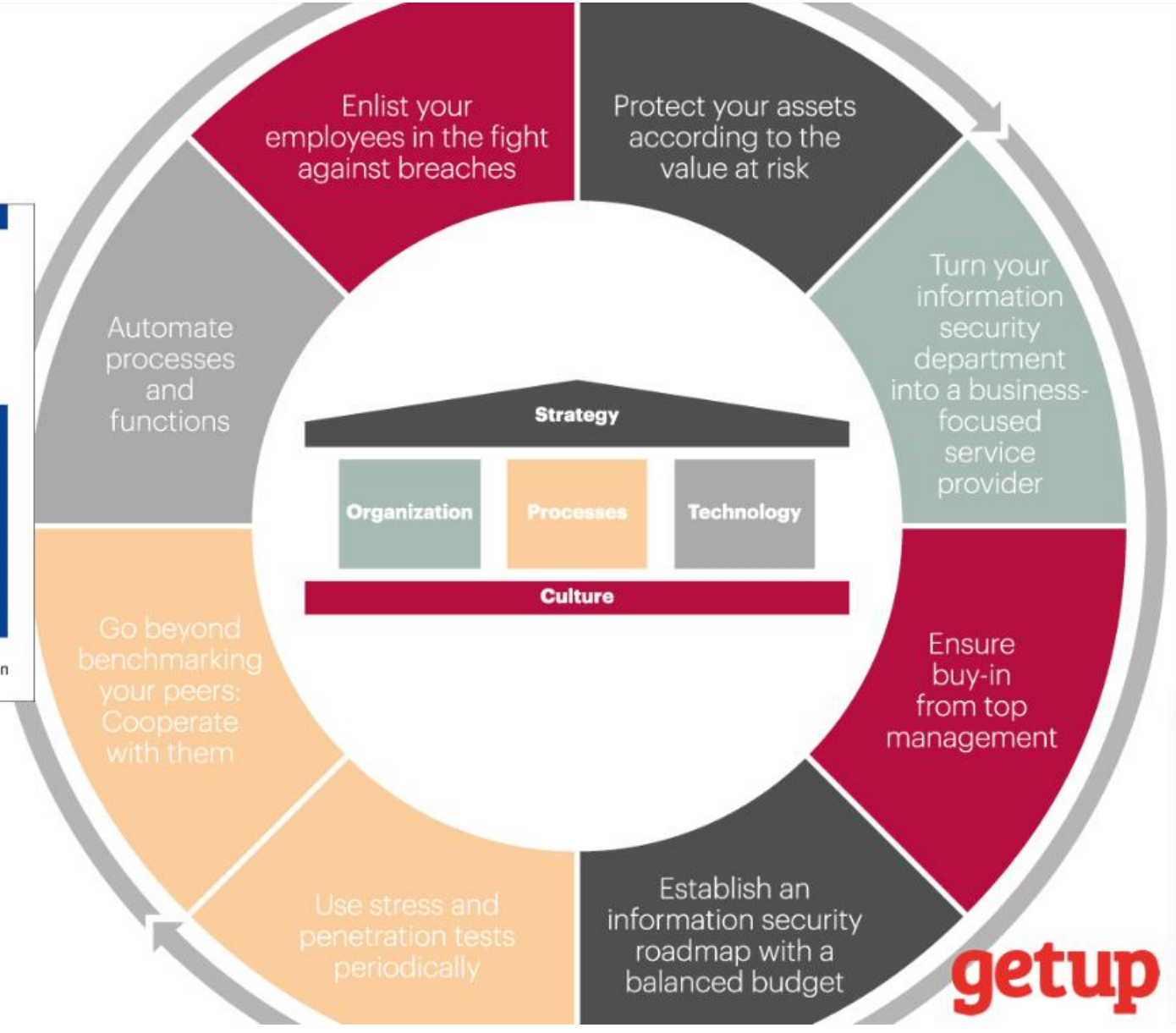

O'REILLY
Practical Cloud Security
A GUIDE FOR SECURE DESIGN AND DEPLOYMENT
Chris Dotson


O'REILLY
Defensive Security Handbook
BEST PRACTICES FOR SECURING INFRASTRUCTURE
Lee Brotherston & Amanda Berlin


Enlist your employees in the fight against breaches
Protect your assets according to the value at risk
Turn your information security department into a business-focused service provider
Ensure buy-in from top management
Establish an information security roadmap with a balanced budget
Use stress and penetration tests periodically
Go beyond benchmarking your peers: Cooperate with them
Automate processes and functions
Strategy
Organization
Processes
Technology
Culture
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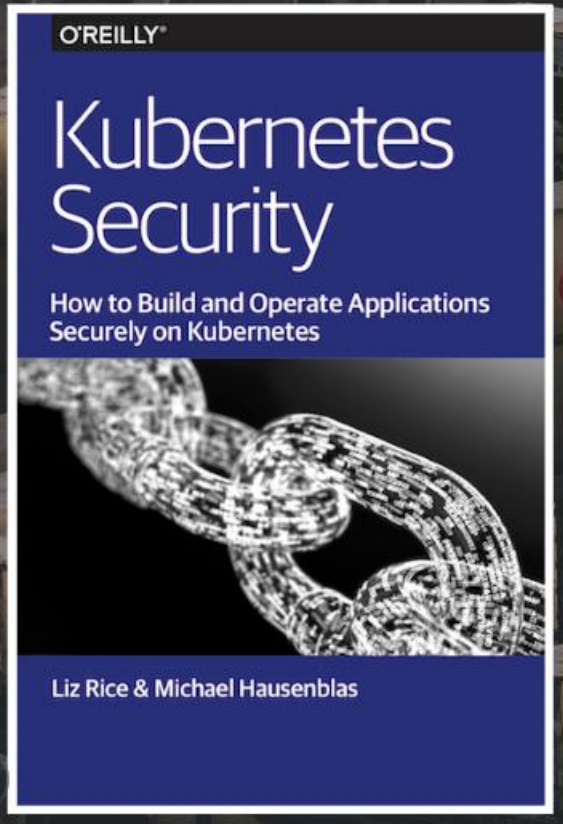
Kubernetes Security



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kube-hunter

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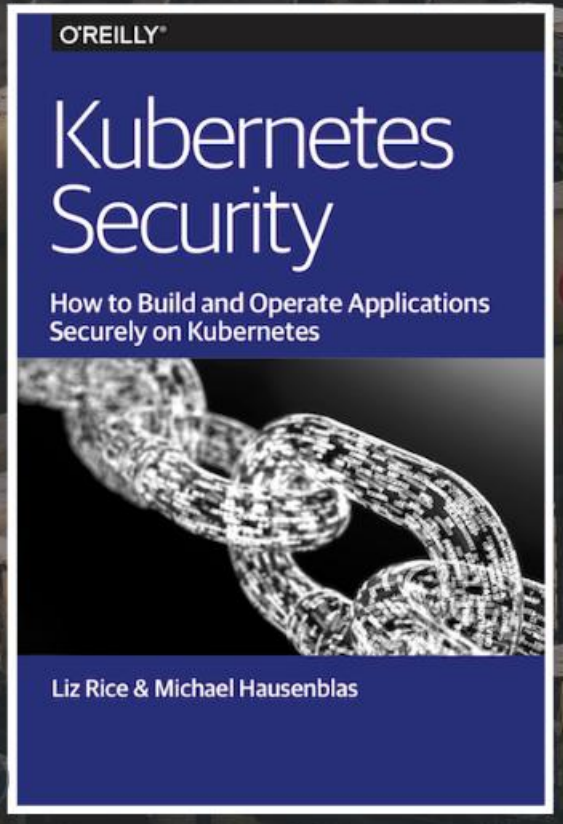
Kubernetes Security



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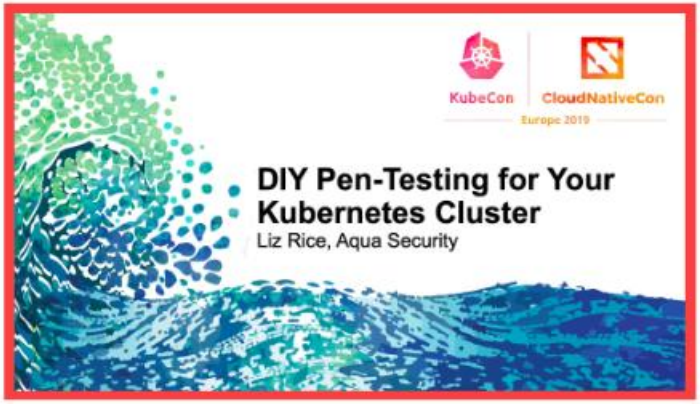
Possible Attacks



YouTube

QRcode-pro.com

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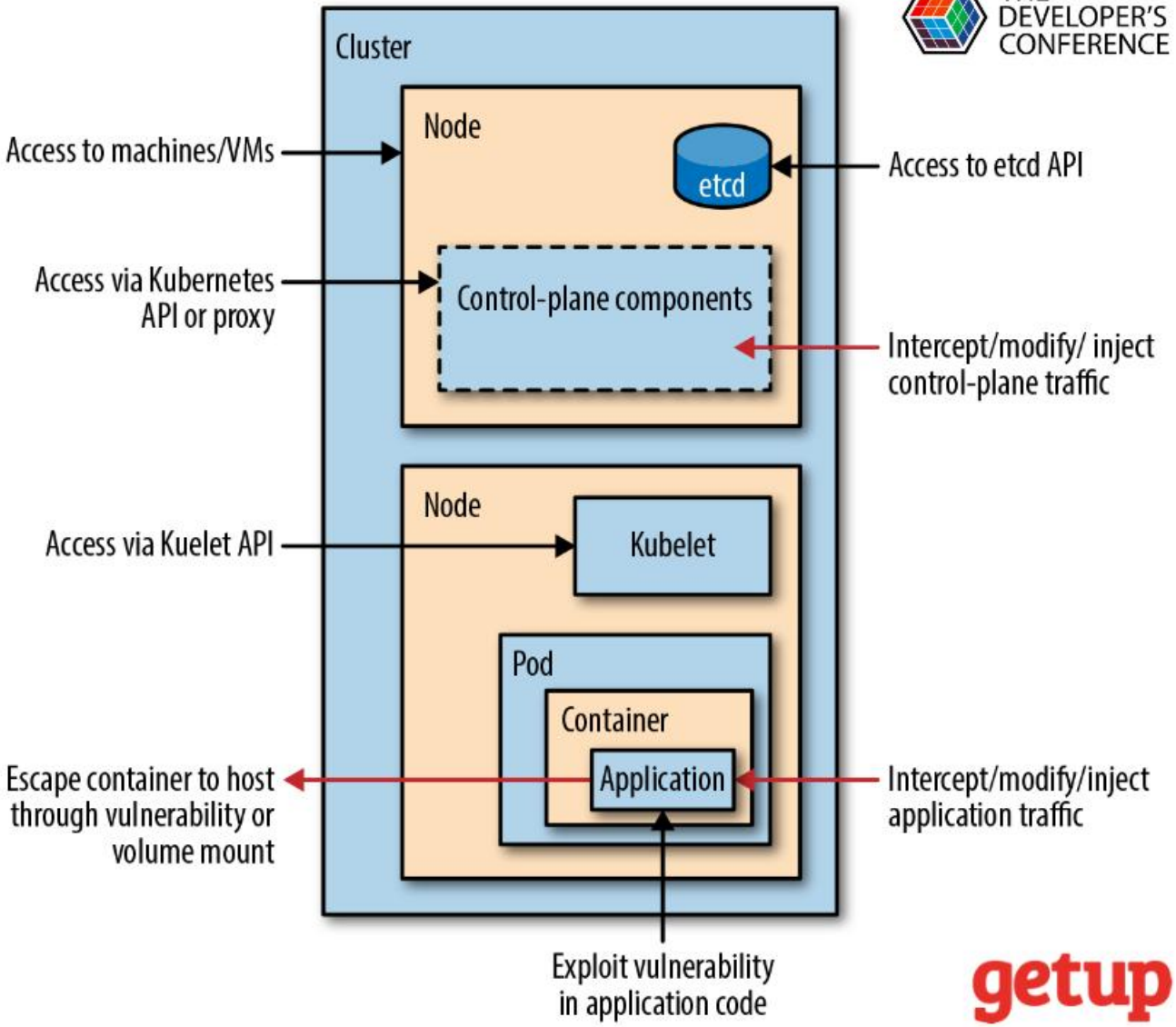

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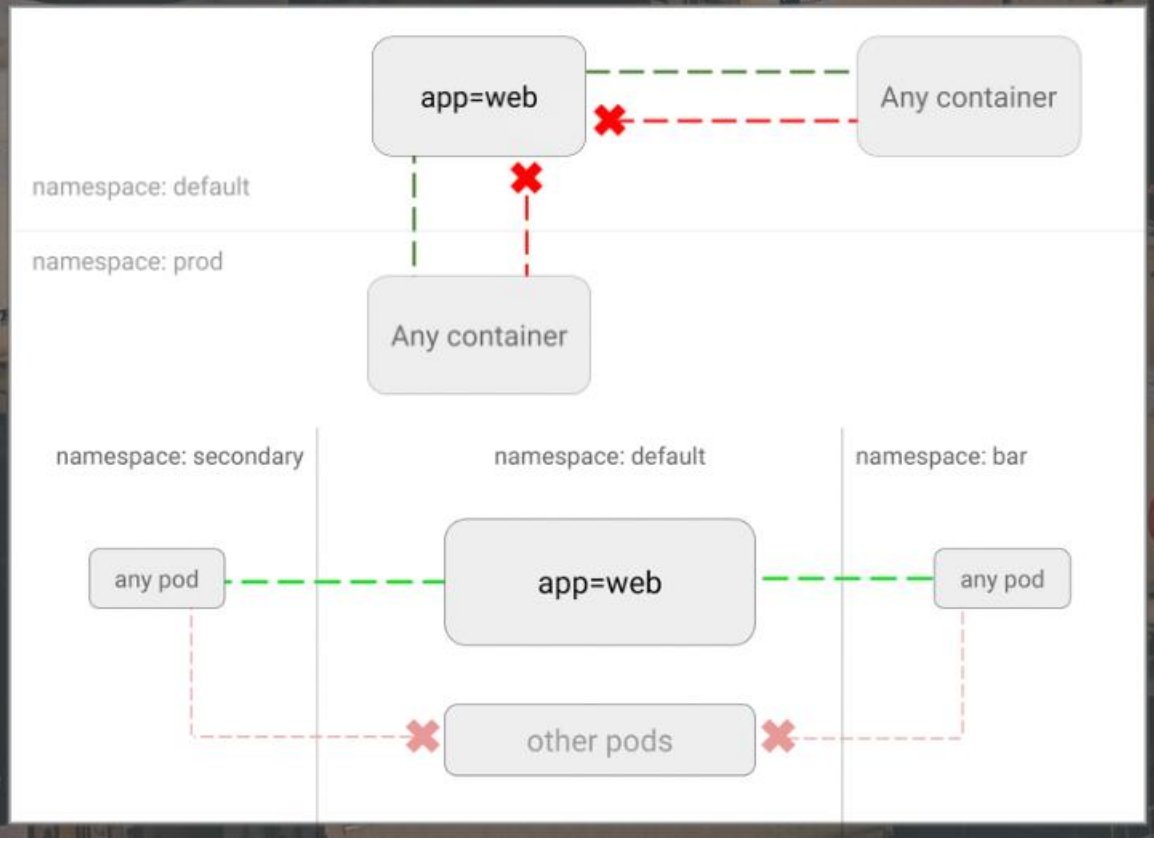
Network Policies




```yaml
---
apiVersion: networking.k8s.io/v1
kind: NetworkPolicy
metadata:
  name: test-network-policy
  namespace: default
spec:
  podSelector:
    matchLabels:
      role: db
  policyTypes:
  - Ingress
  - Egress
  ingress:
  - from:
    - ipBlock:
        cidr: 172.17.0.0/16
        except:
        - 172.17.1.0/24
    - namespaceSelector:
        matchLabels:
          project: myproject
    - podSelector:
        matchLabels:
          role: frontend
    ports:
    - protocol: TCP
      port: 6379
  egress:
  - to:
    - ipBlock:
        cidr: 10.0.0.0/24
    ports:
    - protocol: TCP
      port: 5978
---
```

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How Stuff Works?

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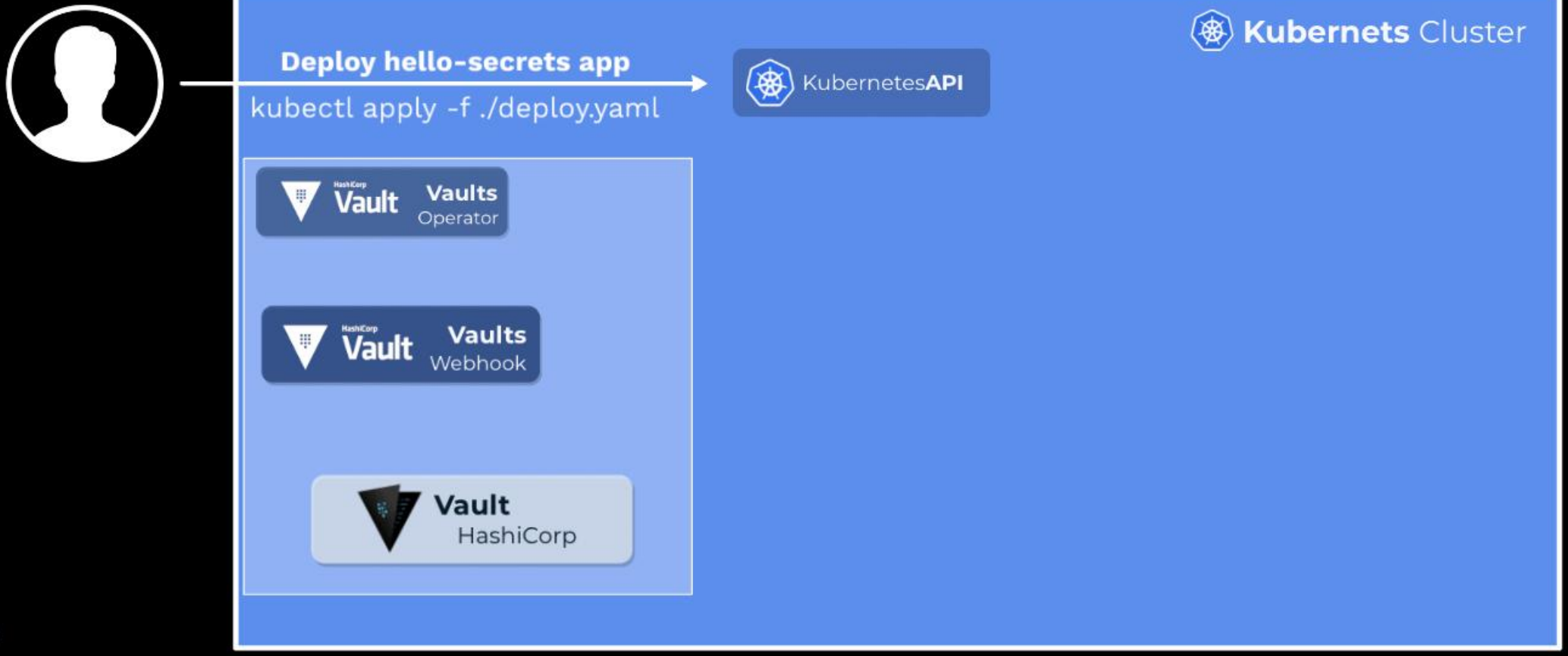

How Stuff Works?

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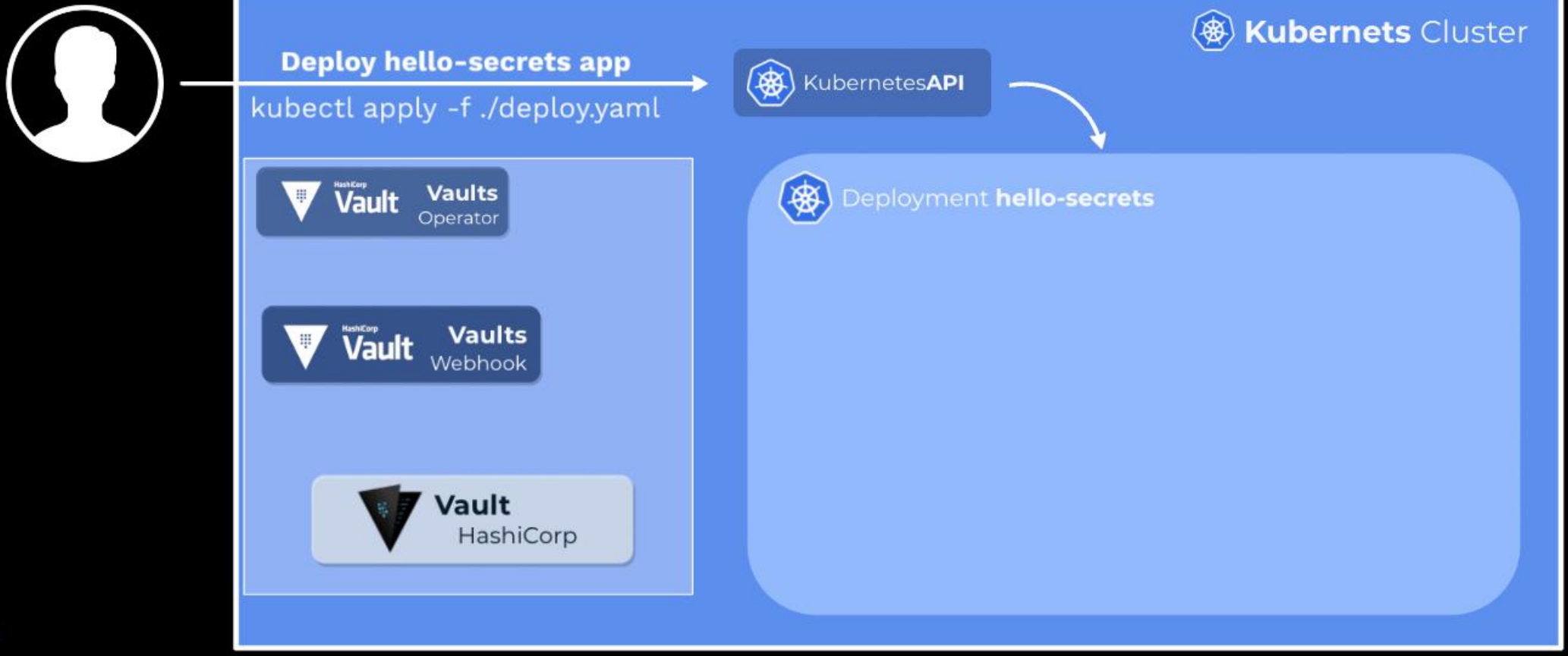

How Stuff Works?

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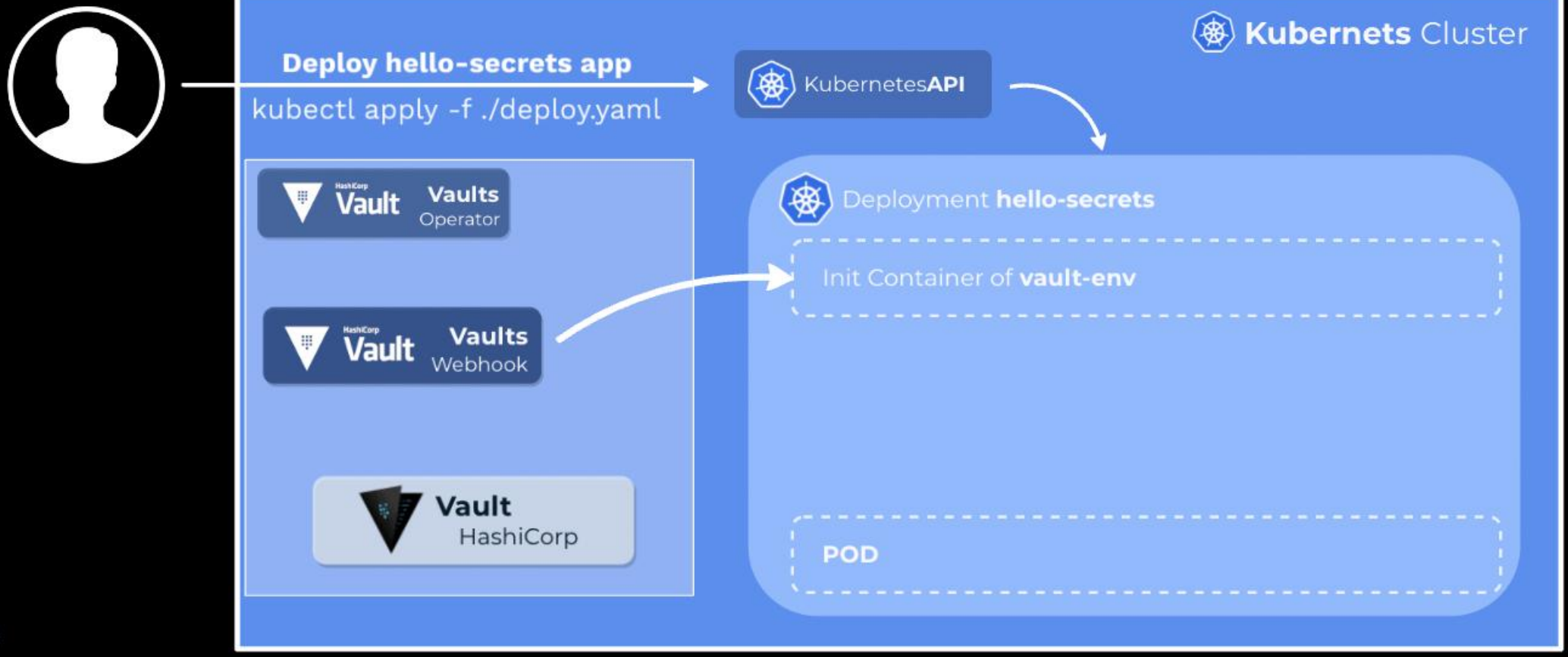

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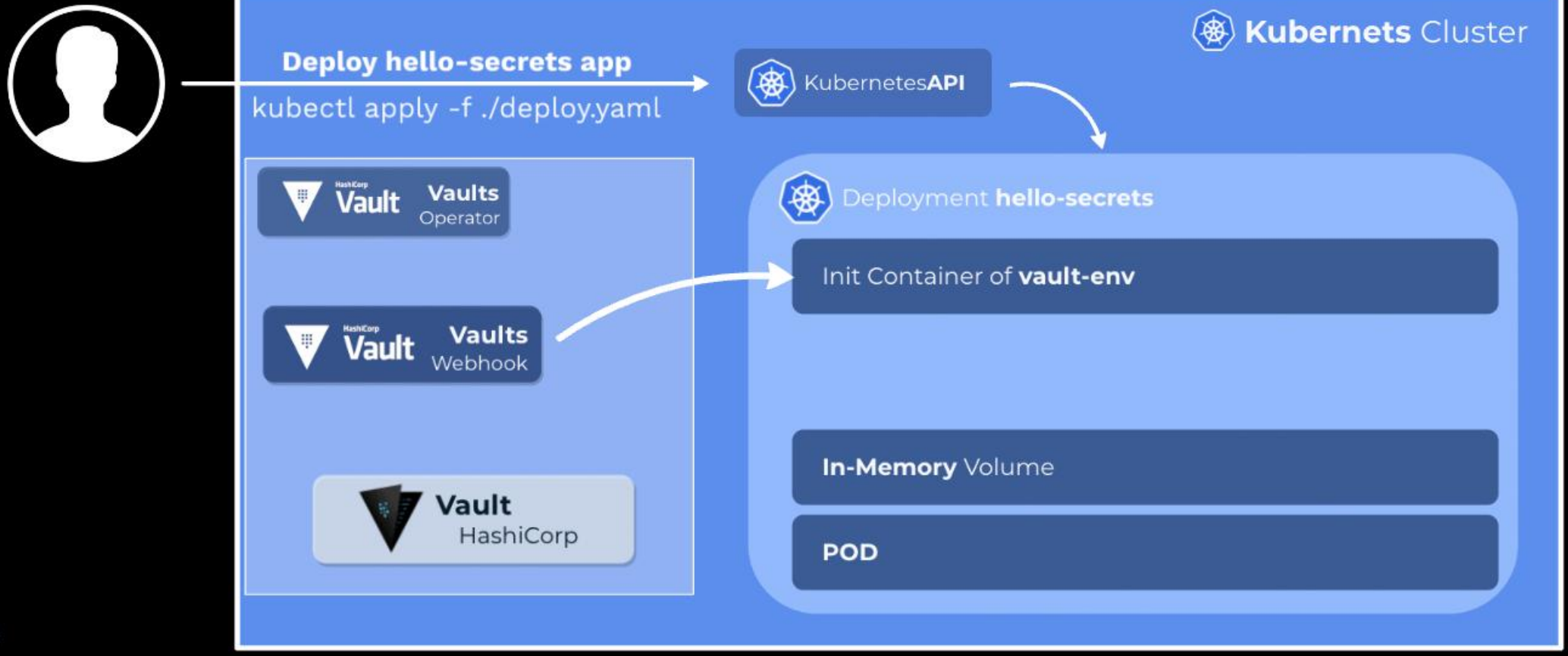

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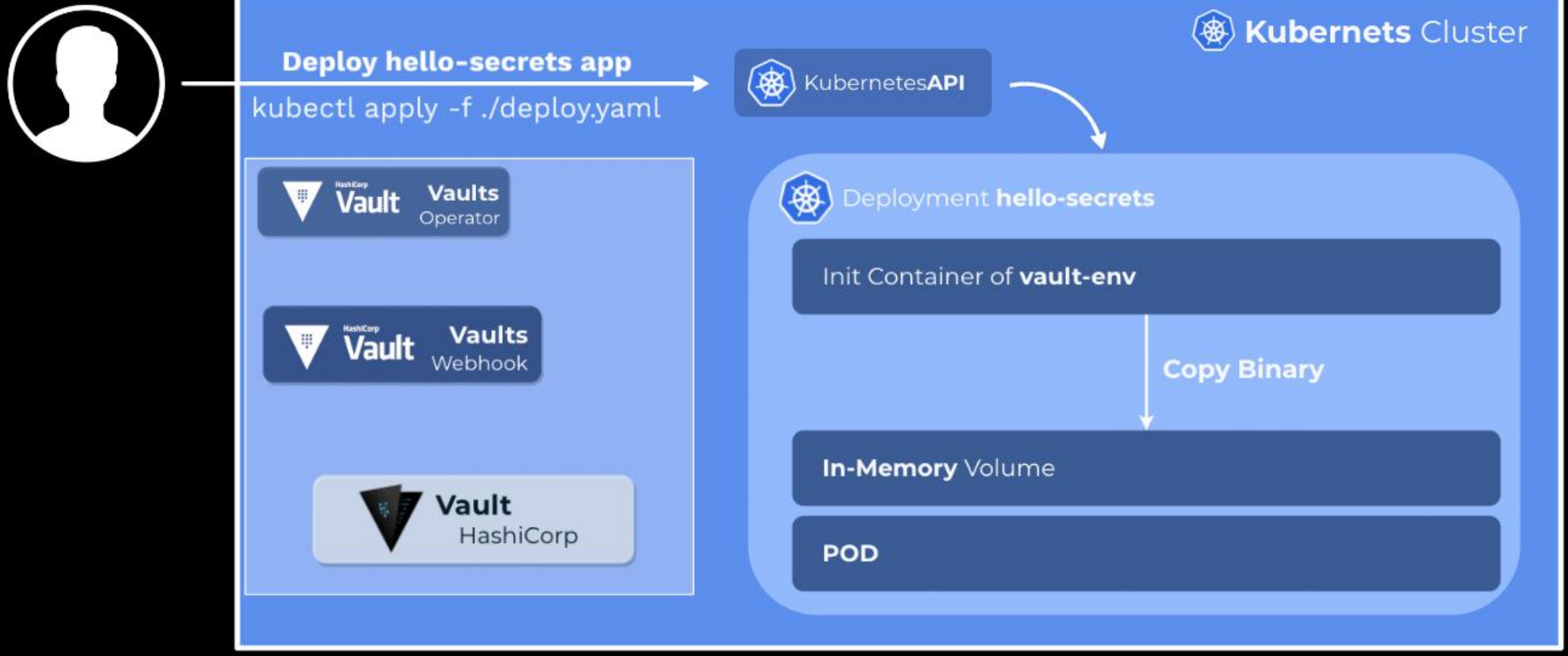

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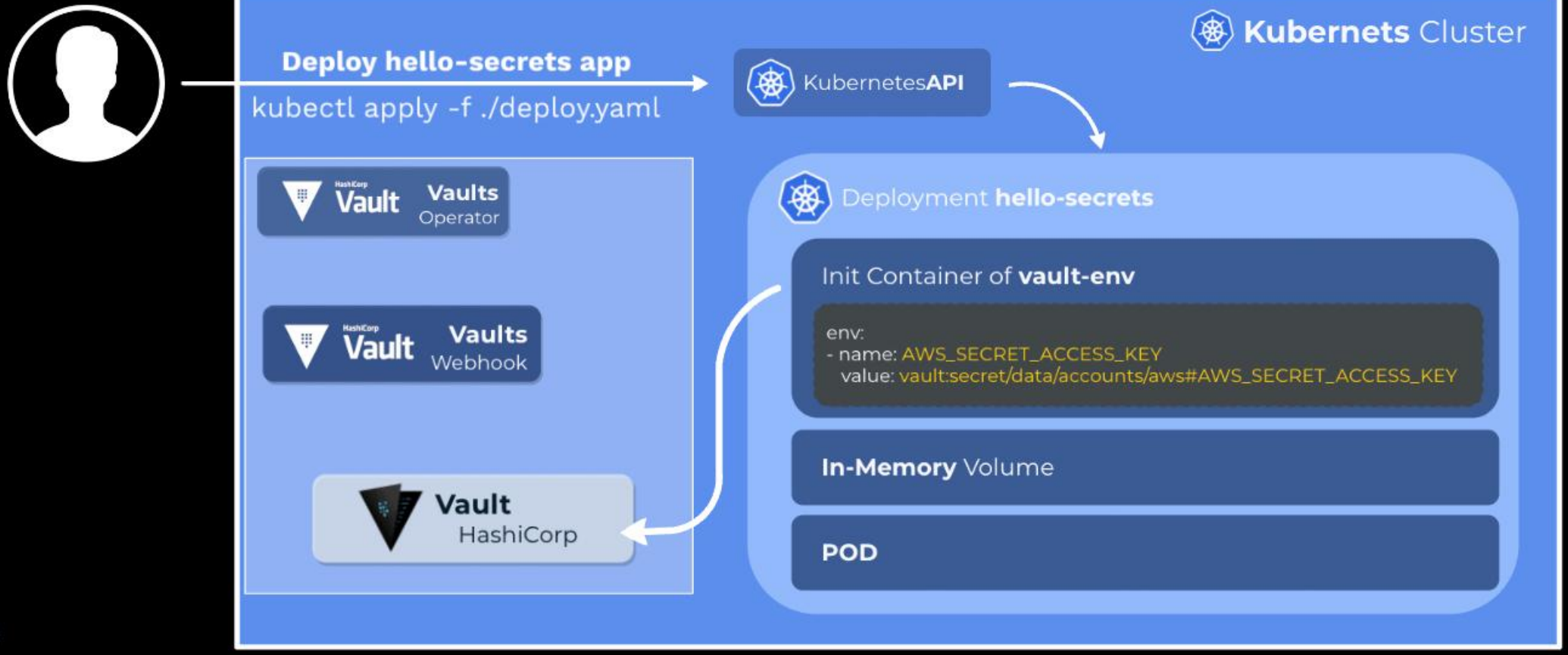

How Stuff Works?

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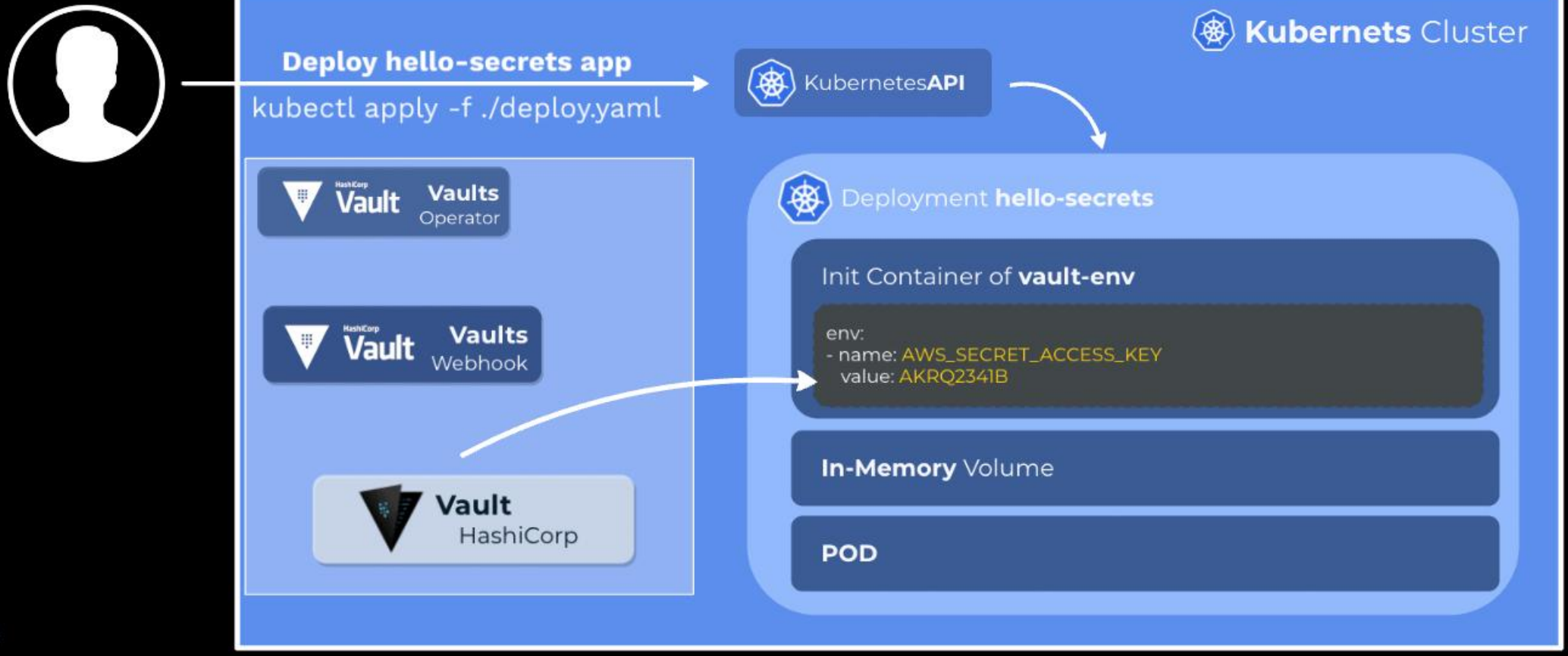

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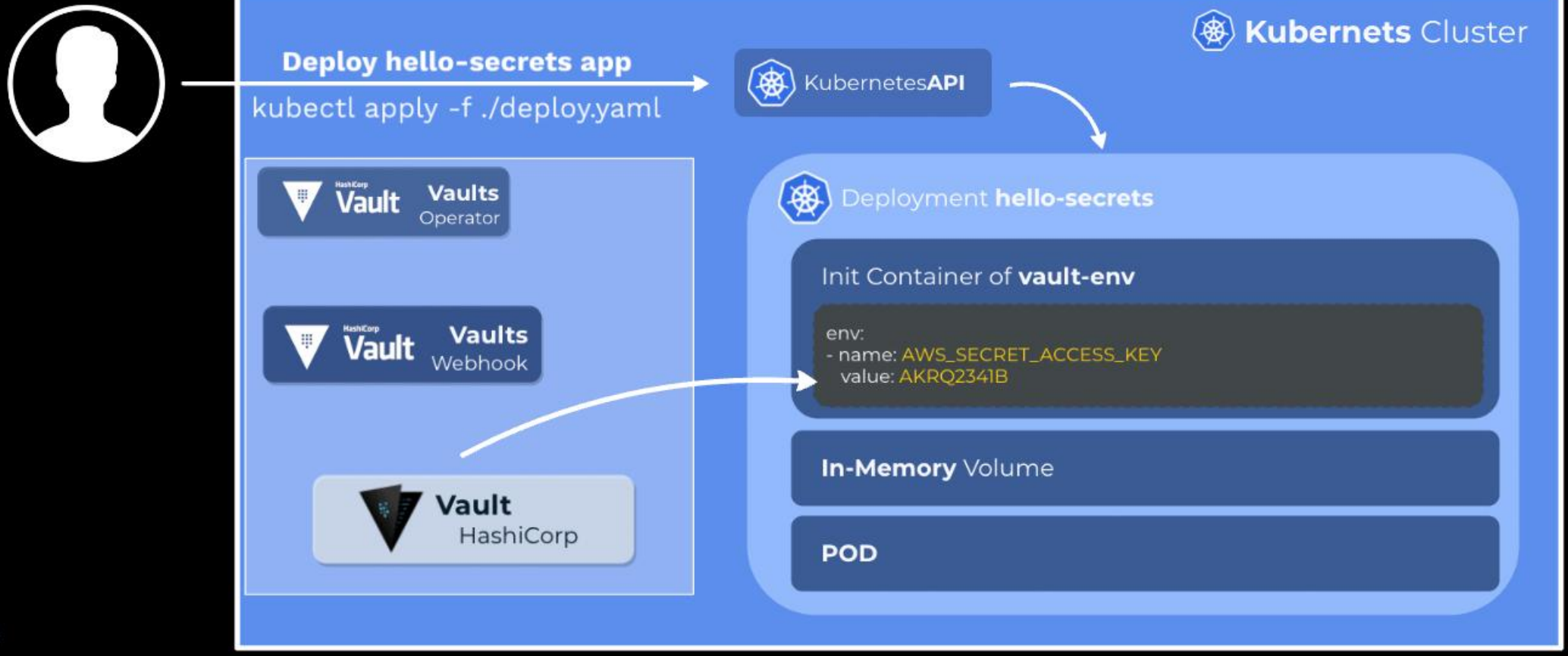

How Stuff Works?

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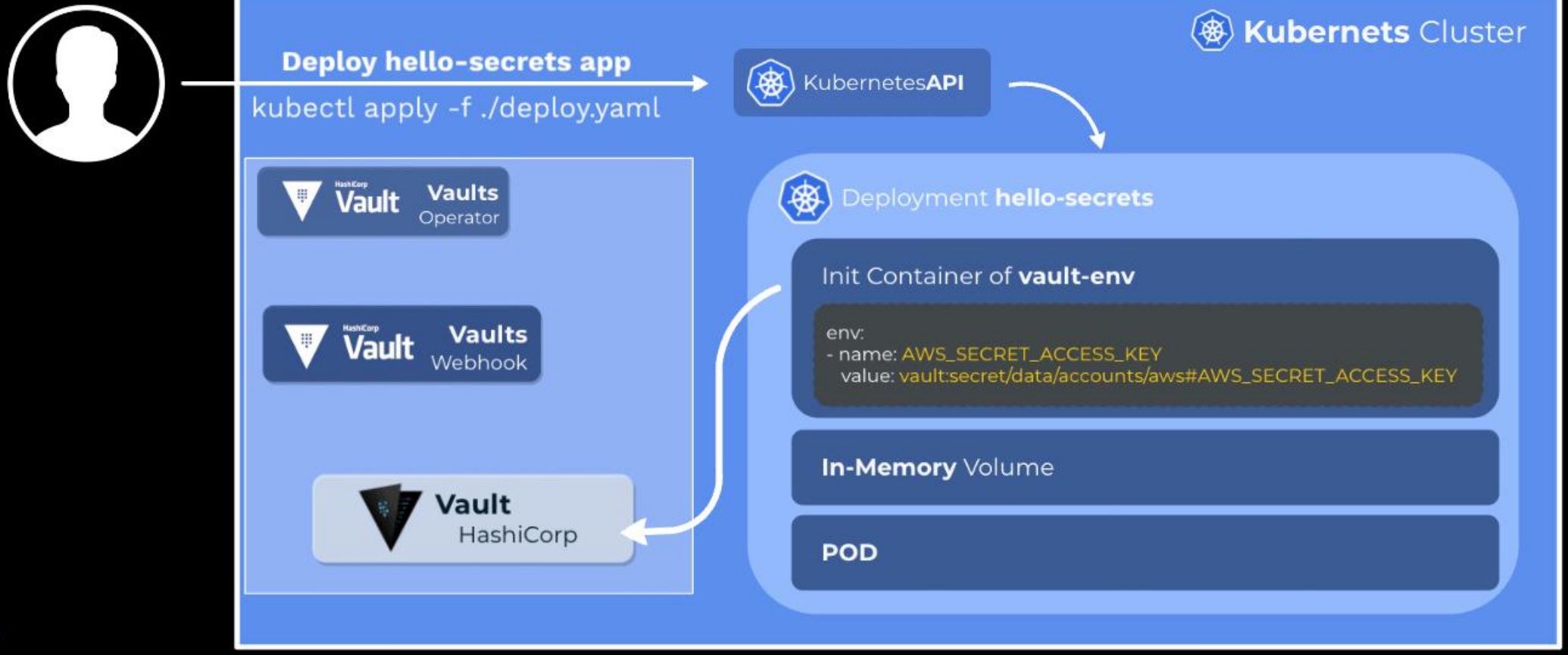

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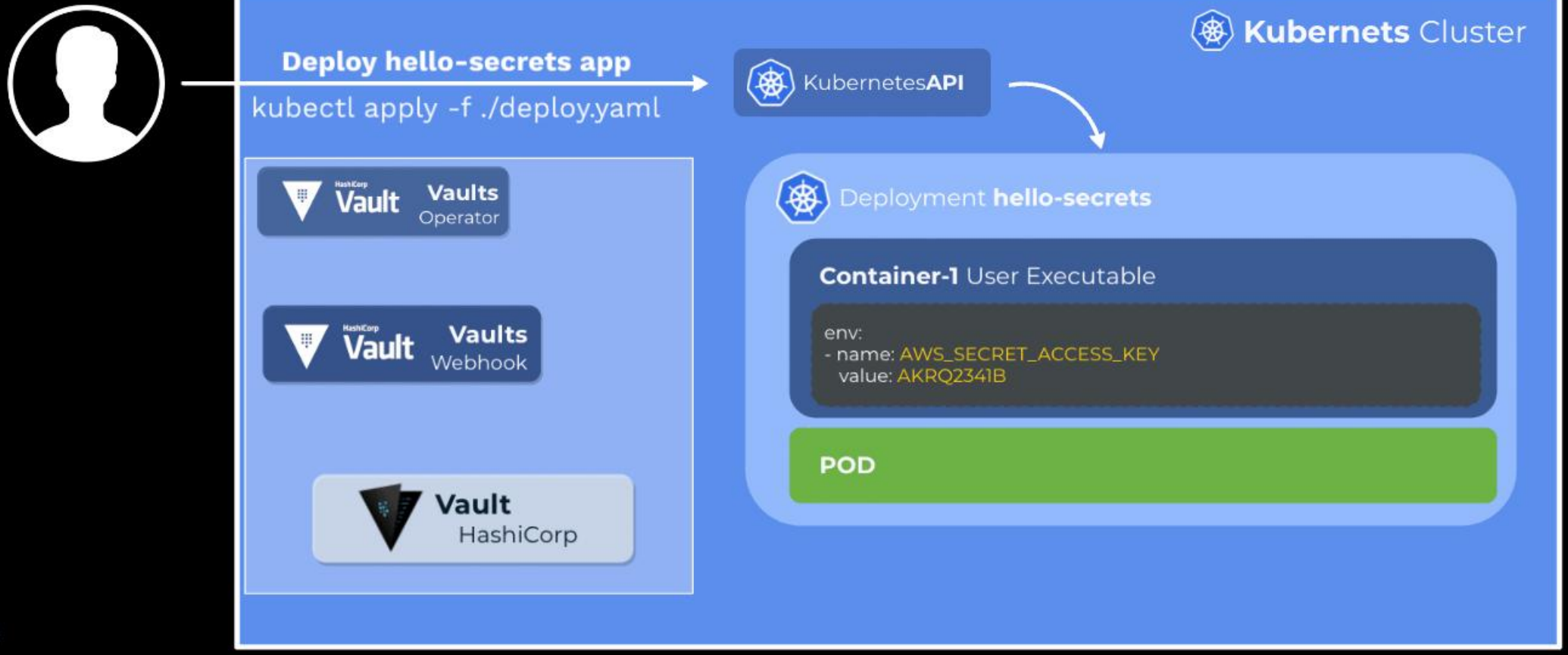

Open Policies Agent - OPA

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Admission Control

1 How Does OPA Work?

2 How Do I Write Policies?

3 How Do I Test Policies?

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Admission Control

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```
> kubectl create -f ingress.yaml
```

Kubernetes
Admission Control

Kubertnetes
API Server

Request → Authentication and Authorization → Admission Controllers: Mutating, Validating

Admission Control

Policies

Context

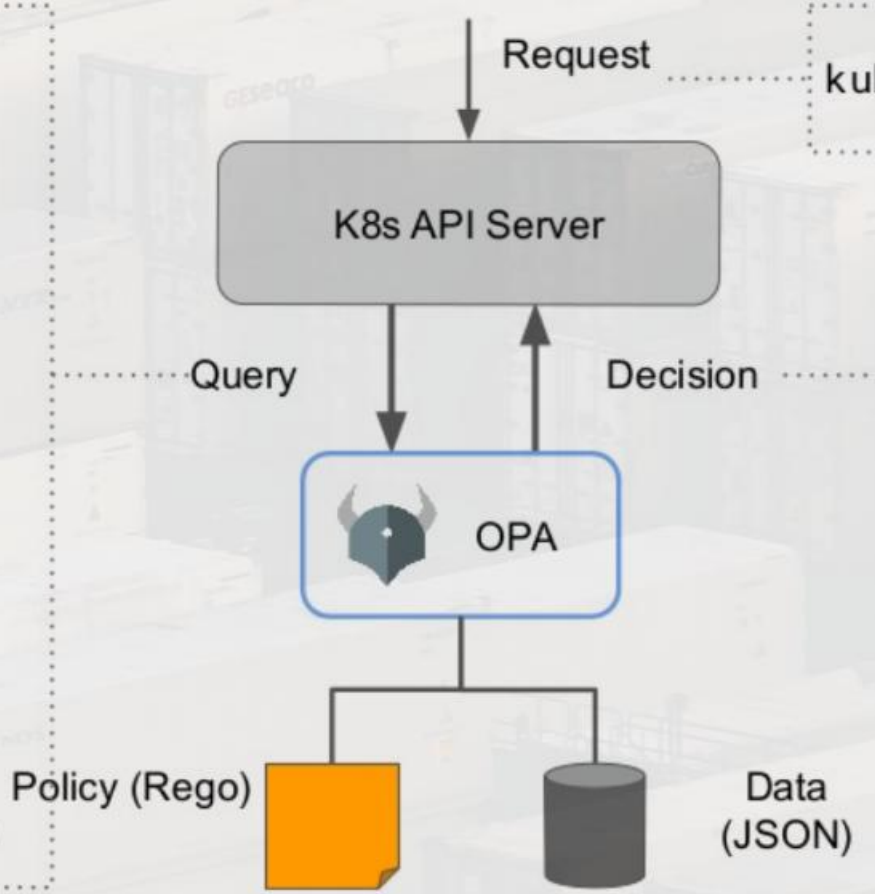
Admission Controller Input

Cached Kubernetes Data

Open Policy Agent
Webhook Admission Controller

How Does OPA Work?

```
kind:
  kind: Deployment
request:
  object:
    metadata:
      name: nginx-deployment
    spec:
      replicas: 2
      selector:
        matchLabels:
          app: nginx
      template:
        metadata:
          labels:
            app: nginx
        spec:
          containers:
          - name: nginx
            image: nginx:1.7.9
```




```
kubectl create -f nginx.yaml
```

```
allow: false
reason: |
  no costcenter label
```

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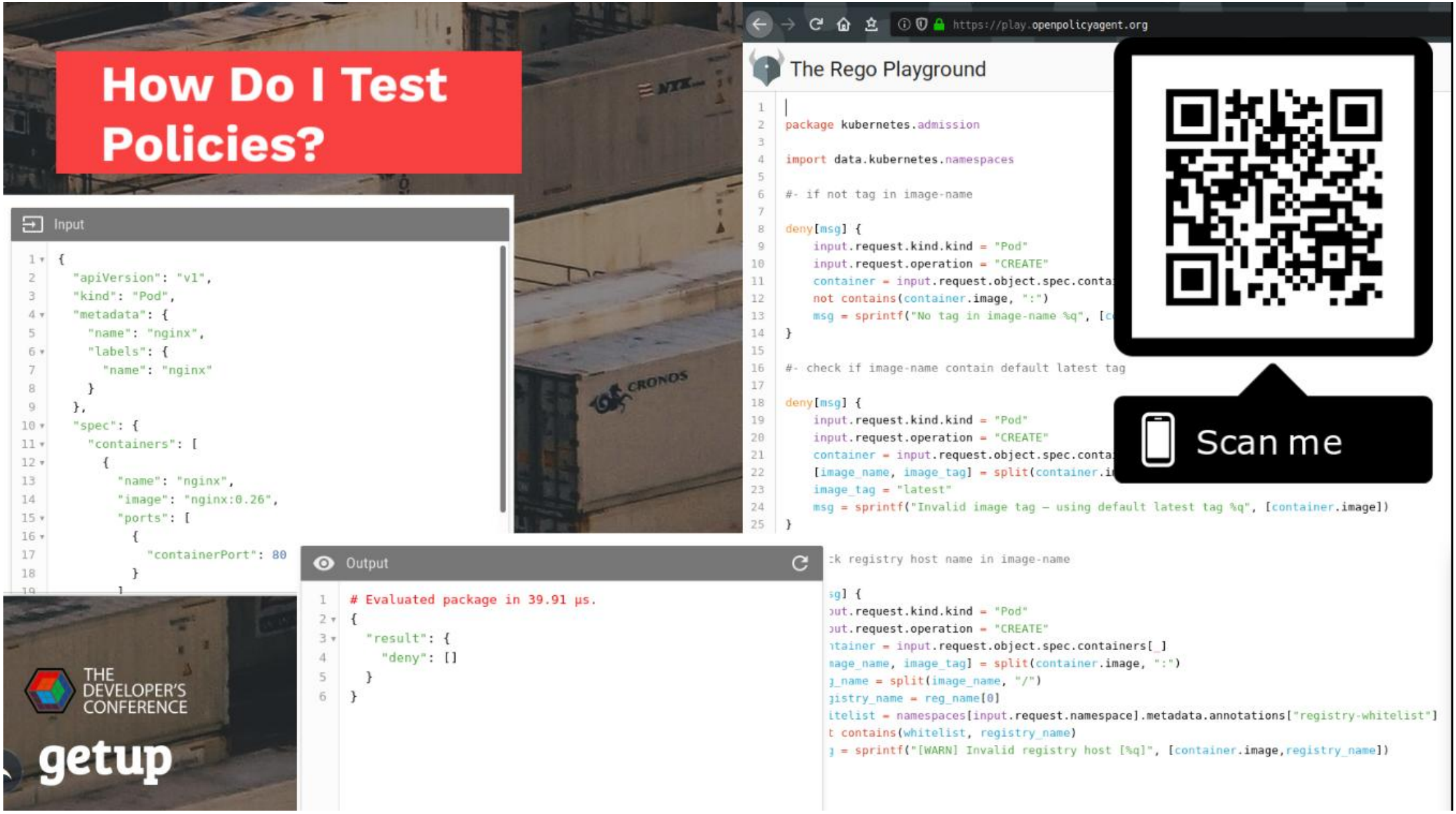
```
package kubernetes.admission

import data.kubernetes.namespaces

#- if not tag in image-name

deny[msg] {
    input.request.kind.kind = "Pod"
    input.request.operation = "CREATE"
    container = input.request.object.spec.containers[_]
    not contains(container.image, ":")
    msg = sprintf("No tag in image-name %q", [container.image])
}

#- check if image-name contain default latest tag

deny[msg] {
    input.request.kind.kind = "Pod"
    input.request.operation = "CREATE"
    container = input.request.object.spec.containers[_]
    [image_name, image_tag] = split(container.image, ":")
    image_tag = "latest"
    msg = sprintf("Invalid image tag - using default latest tag %q", [container.image])
}

#- check registry host name in image-name

deny[msg] {
    input.request.kind.kind = "Pod"
    input.request.operation = "CREATE"
    container = input.request.object.spec.containers[_]
    [image_name, image_tag] = split(container.image, ":")
    reg_name = split(image_name, "/")
    registry_name = reg_name[0]
    whitelist = namespaces[input.request.namespace].metadata.annotations["registry-whitelist"]
    not contains(whitelist, registry_name)
    msg = sprintf("[WARN] Invalid registry host [%q]", [container.image,registry_name])
}
```


How Do I Test Policies?
Input
{
"apiVersion": "v1",
"kind": "Pod",
"metadata": {
"name": "nginx",
"labels": {
"name": "nginx"
}
},
"spec": {
"containers": [
{
"name": "nginx",
"image": "nginx:0.26",
"ports": [
{
"containerPort": 80
}
Output
# Evaluated package in 39.91 µs.
{
"result": {
"deny": []
}
}
https://play.openpolicyagent.org
The Rego Playground
package kubernetes.admission
import data.kubernetes.namespaces
#- if not tag in image-name
deny[msg] {
input.request.kind.kind = "Pod"
input.request.operation = "CREATE"
container = input.request.object.spec.conta
not contains(container.image, ":")
msg = sprintf("No tag in image-name %q", [c
}
#- check if image-name contain default latest tag
deny[msg] {
input.request.kind.kind = "Pod"
input.request.operation = "CREATE"
container = input.request.object.spec.conta
[image_name, image_tag] = split(container.i
image_tag = "latest"
msg = sprintf("Invalid image tag - using default latest tag %q", [container.image])
}
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Obrigado!! :)

Bruno S. Brasil

System Engineer / SRE

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