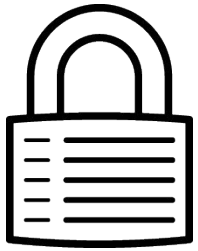
Red Hat
OpenShift

OpenShift Security
The usage of PKI Infrastructures

Stronger Platform Security

Defense in Depth



CONTROL
Application Security

- FIPS Compliance
- Encrypt etcd datastore
- RHEL CoreOS network bound disk encryption

DEFEND
Infrastructure

- Private clusters with existing VPN / VPC
- Internal ingress controller
- Ingress Cipher & TLS Policy Configuration

EXTEND

- Log forwarding (tech preview)

Self-Service

Multi-language

Automation

Collaboration

Multi-tenant

Standards-based

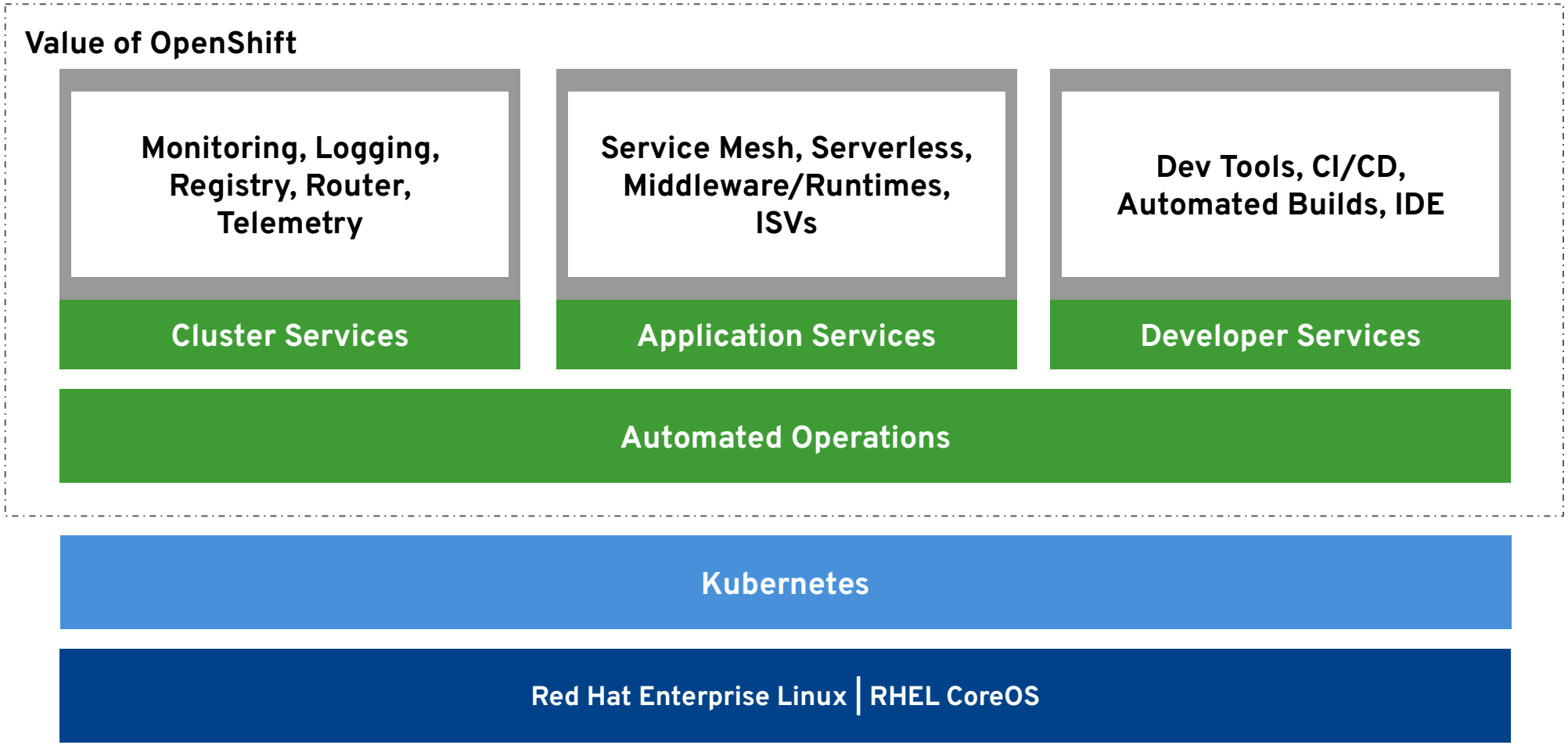
Web-scale

Open Source

Enterprise Grade

Secure

Red Hat

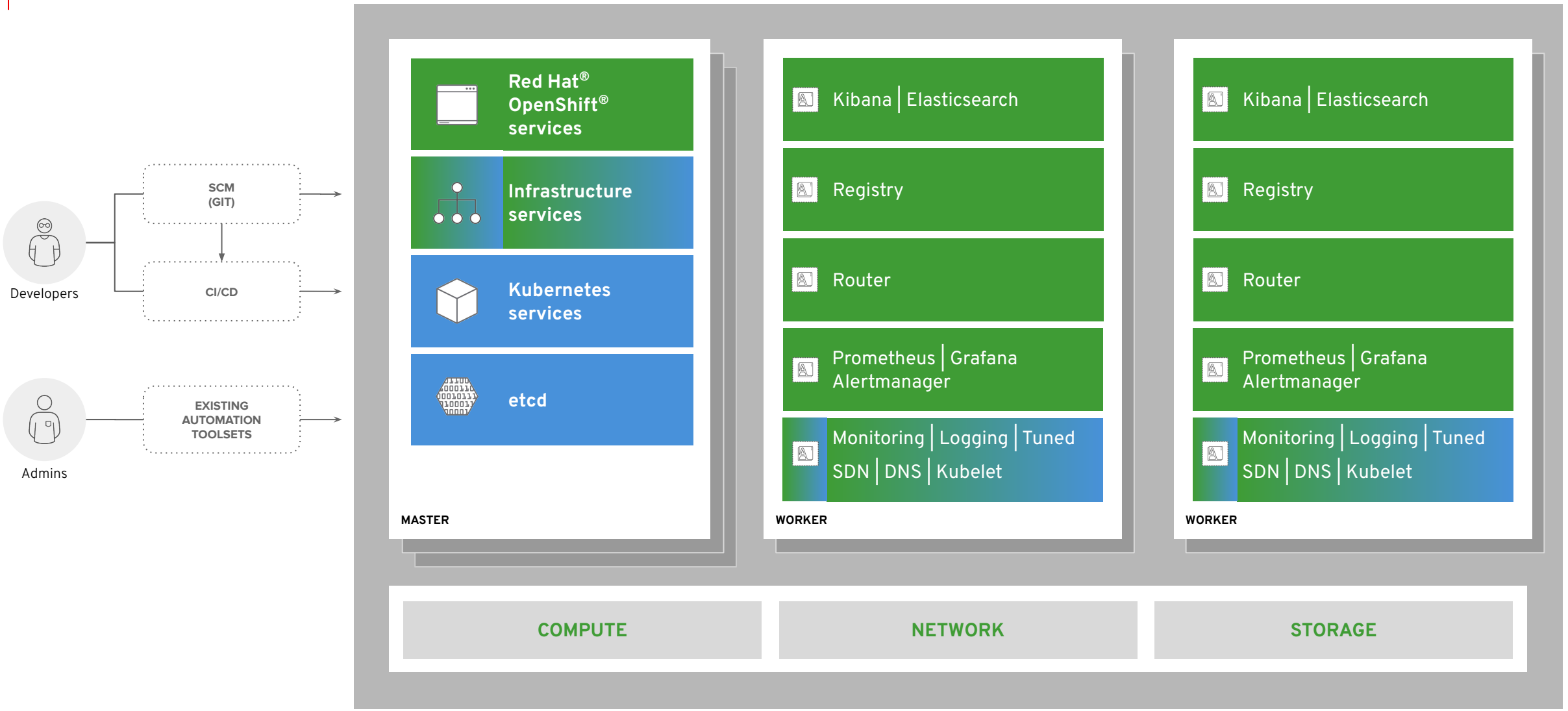


Best IT Ops Experience

CaaS ⟷ PaaS ⟷ FaaS

Best Developer Experience

Red Hat


SCM (GIT)
Developers
CI/CD
EXISTING AUTOMATION TOOLSETS
Admins
Red Hat® OpenShift® services
Infrastructure services
Kubernetes services
etcd
MASTER
Kibana | Elasticsearch
Registry
Router
Prometheus | Grafana Alertmanager
Monitoring | Logging | Tuned
SDN | DNS | Kubelet
WORKER
Kibana | Elasticsearch
Registry
Router
Prometheus | Grafana Alertmanager
Monitoring | Logging | Tuned
SDN | DNS | Kubelet
WORKER
COMPUTE
NETWORK
STORAGE

Red Hat

Red Hat Enterprise Linux CoreOS

4.3 Image Availability: (* = new)

- OpenStack
- GCP
- Azure
- Amazon
- vSphere
- Bare Metal (unified x86_64 image)*
- IBM Z (DASD & FCP via z-stream)*

FIPS mode support:

- Enforces FIPS validated ciphers for node-level cryptography
- Configurable at install/provisioning

Network Bound Disk Encryption:

- Provides encryption for local storage
- Addresses disk/image theft
- Platform/cloud agnostic implementation
- TPM/vTPM (v2) and Tang endpoints for automatic decryption

Kmods via containers:

- A framework to build and load 3rd party kmods
- Viable for drivers unsuitable for the SRO

OpenShift 4 Fips 140-2 Compliant Cluster

FIPS ready Services

- When built with RHEL 7/8 base image

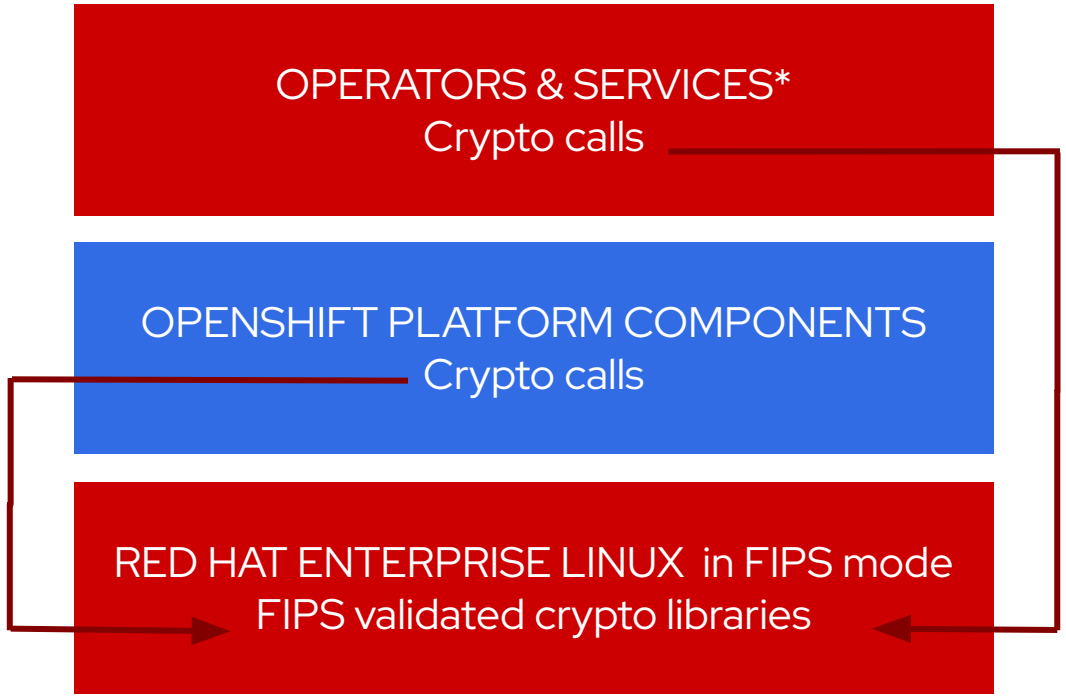
OpenShift calls FIPS validated crypto

- When running on RHEL in FIPS mode, OpenShift components bypass go cryptographic routines and call into a RHEL FIPS 140-2 validated cryptographic library
- This feature is specific to binaries built with the RHEL go compiler and running on RHEL

RHEL CoreOS FIPS mode

- Configure at install to enforce FIPS validated ciphers for node-level cryptography

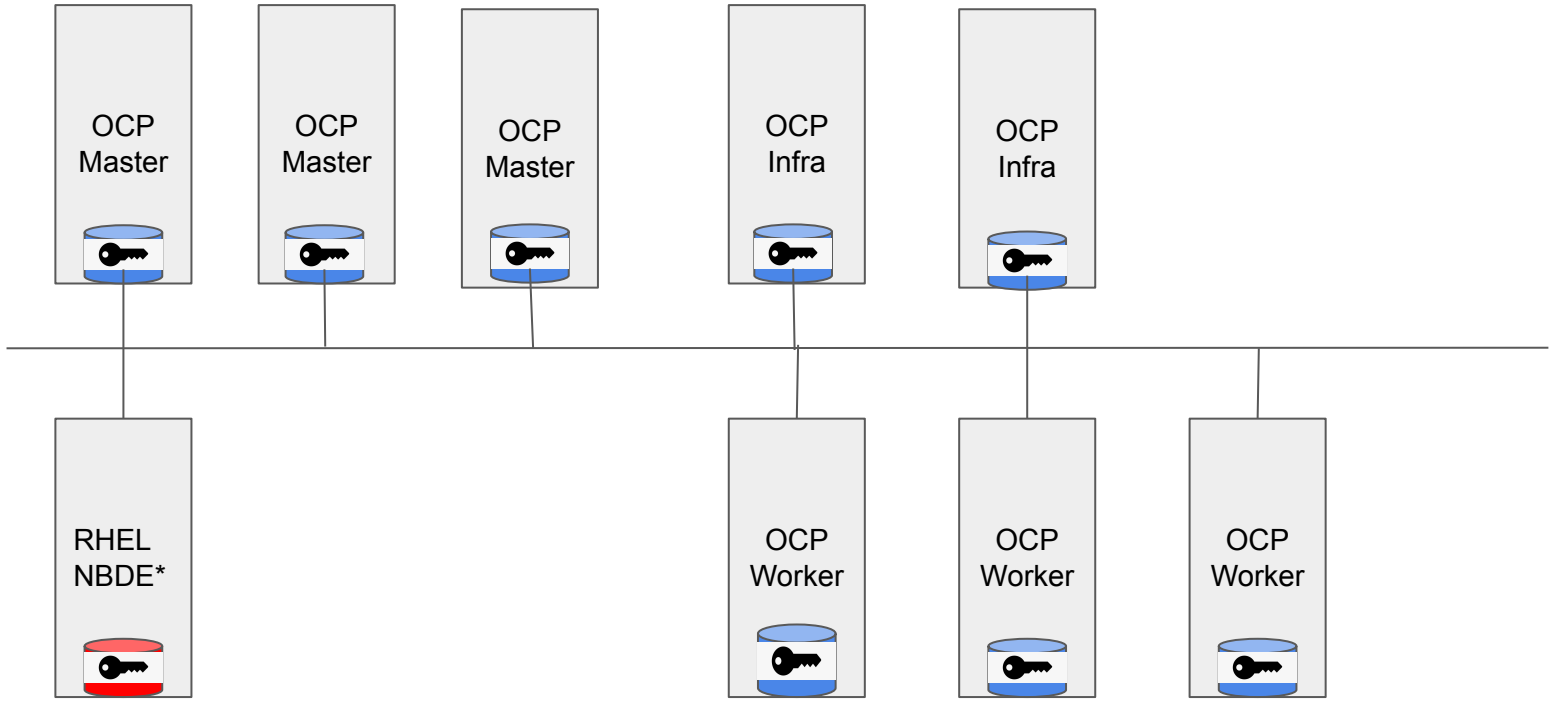
Note: products are not FIPS validated, only libraries.



*When built with RHEL base images

More about RHEL go and FIPS 140-2

Encrypting the Disk of the OCP Nodes



*Network bound disk encryption (Clavis & Tang)

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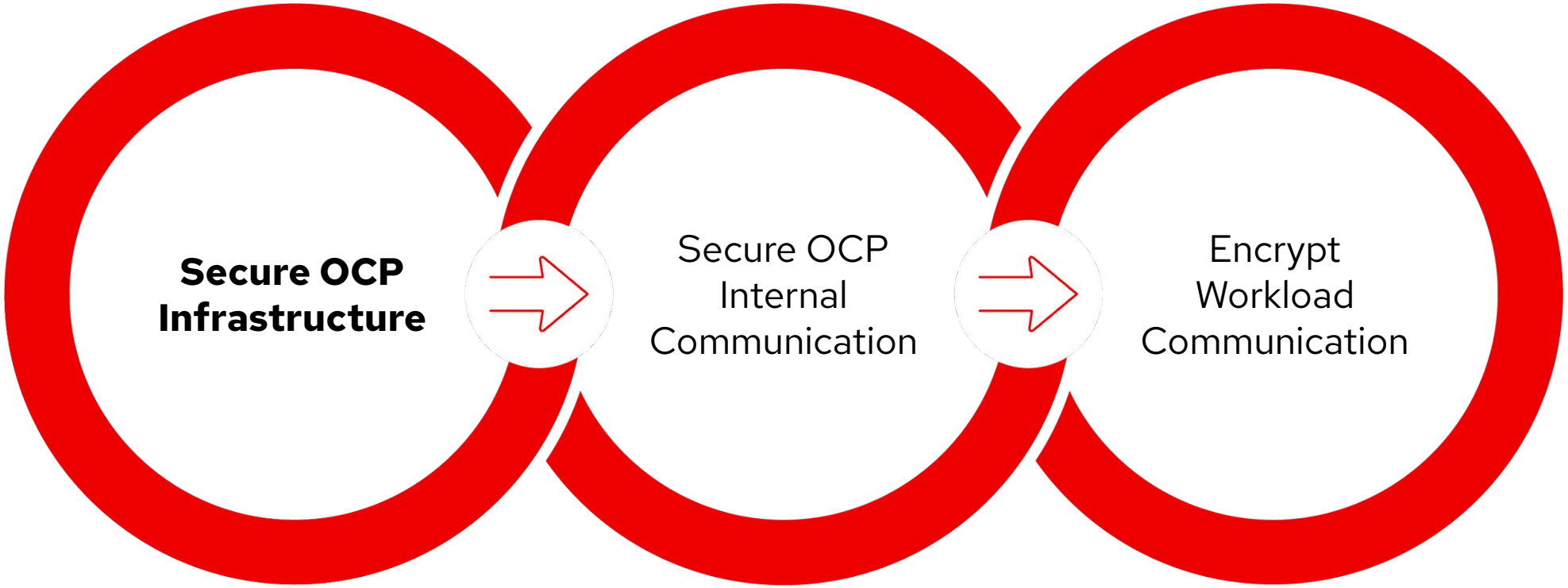
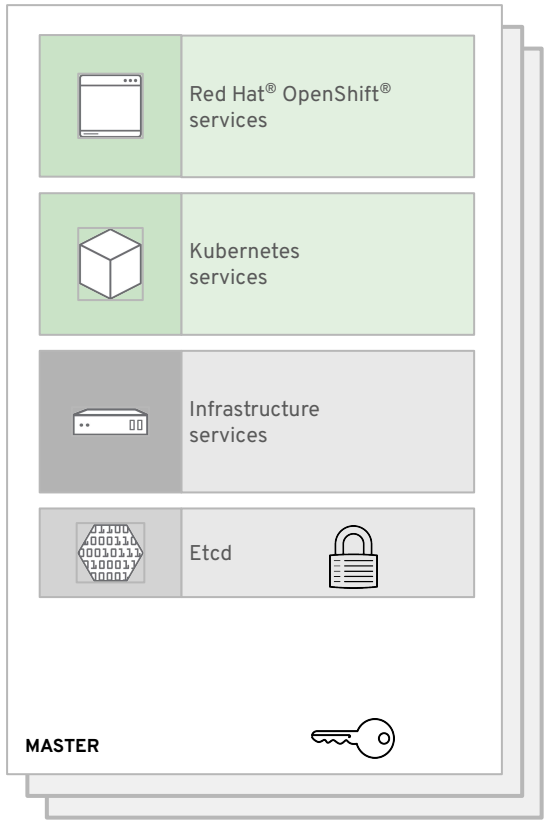
PKI in OpenShift



OpenShift 4 etcd Encryption

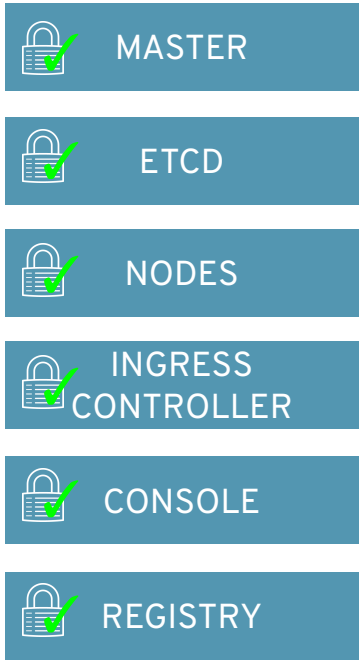
Encrypt secrets, config maps…

- Encryption of the etcd datastore is optional. Once enabled, encryption cannot be disabled.
- The aes-cbc cipher is used.
- Keys are created and automatically rotated by an operator and stored on the master node's file system.
- Keys are available as a secret via the kube API to a cluster admin.
- Assuming a healthy cluster: after enabling encryption, within a day, all relevant items in etcd are encrypted
- Backup: The etcd data store should be backed up separately from the file system with the key.
- Disaster recovery: a backup of both the encrypted etcd data and encryption keys must be available.

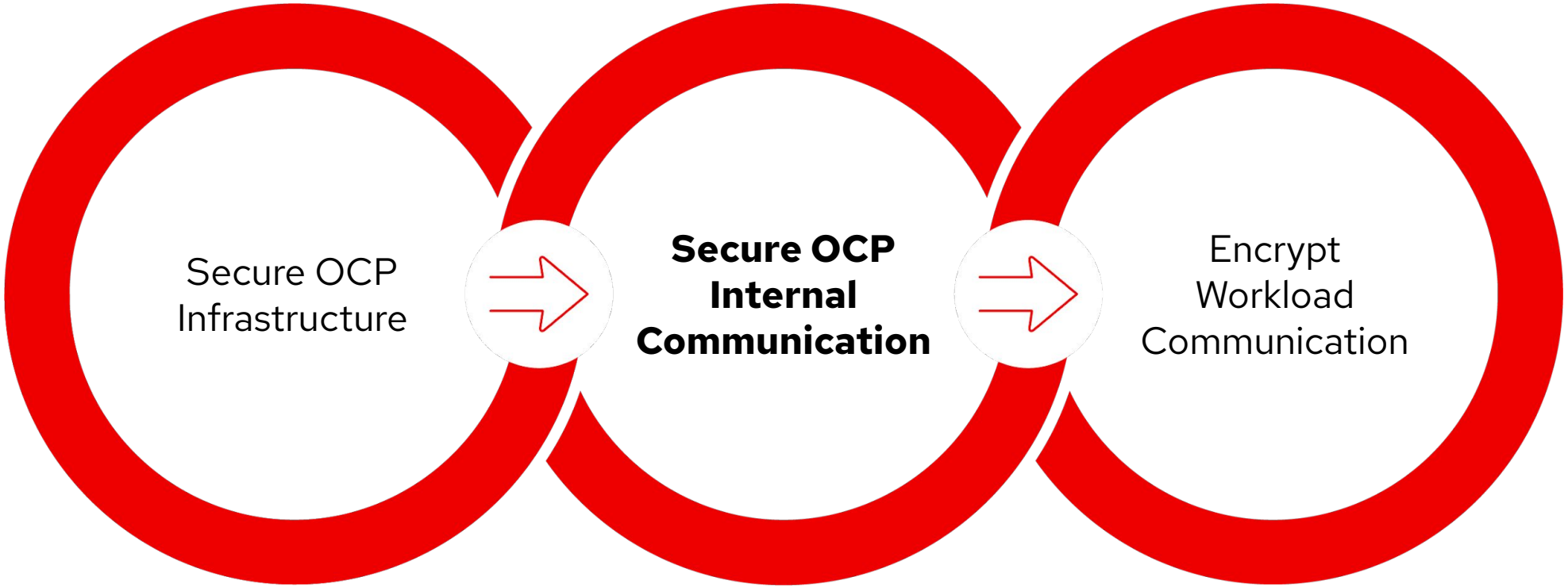


Certificates and Certificate Management

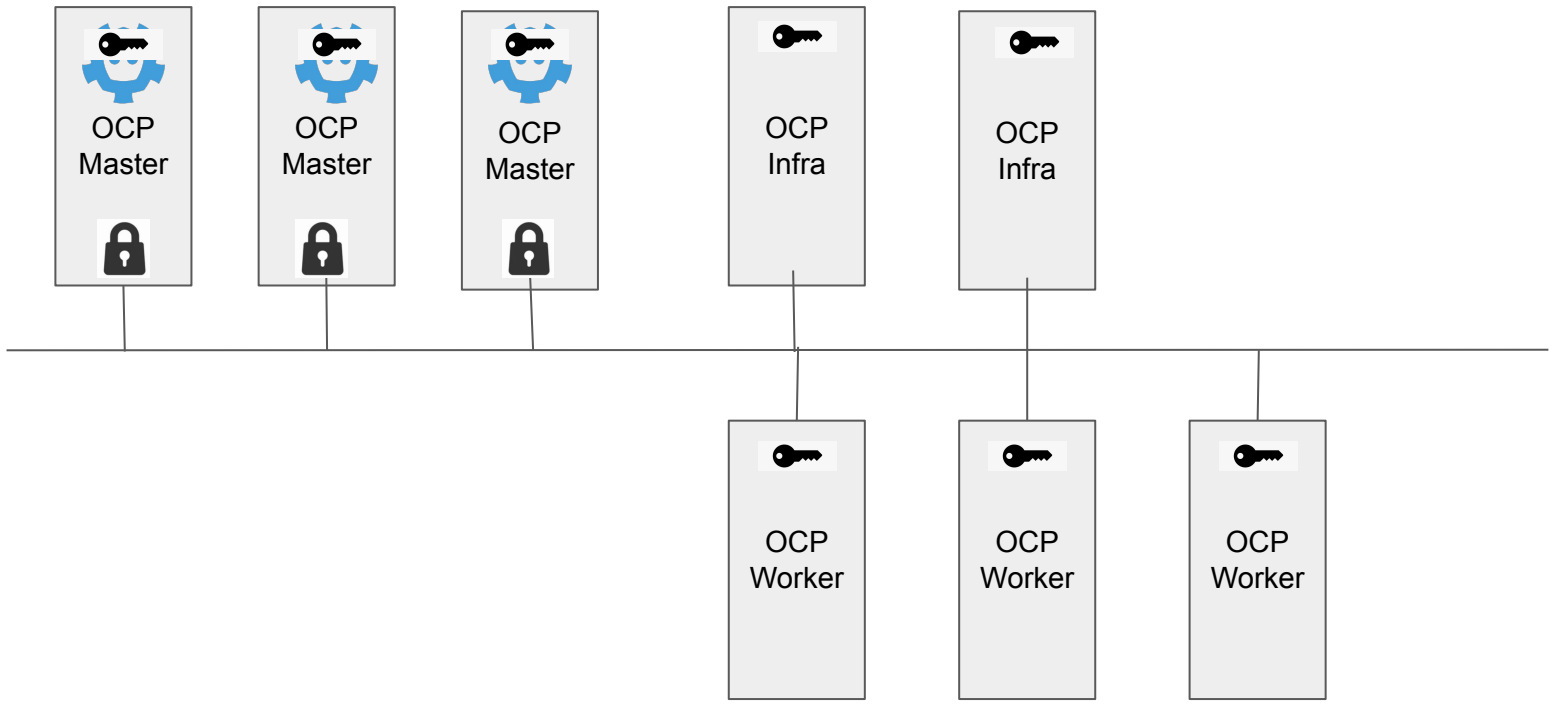
- OpenShift provides its own internal CA
- Certificates are used to provide secure connections to
  - master (APIs) and nodes
  - Ingress controller and registry
  - etcd
- Certificate rotation is automated
- Optionally configure external endpoints to use custom certificates



PKI in OpenShift



Network communication inside an OCP Cluster is PKI encrypted



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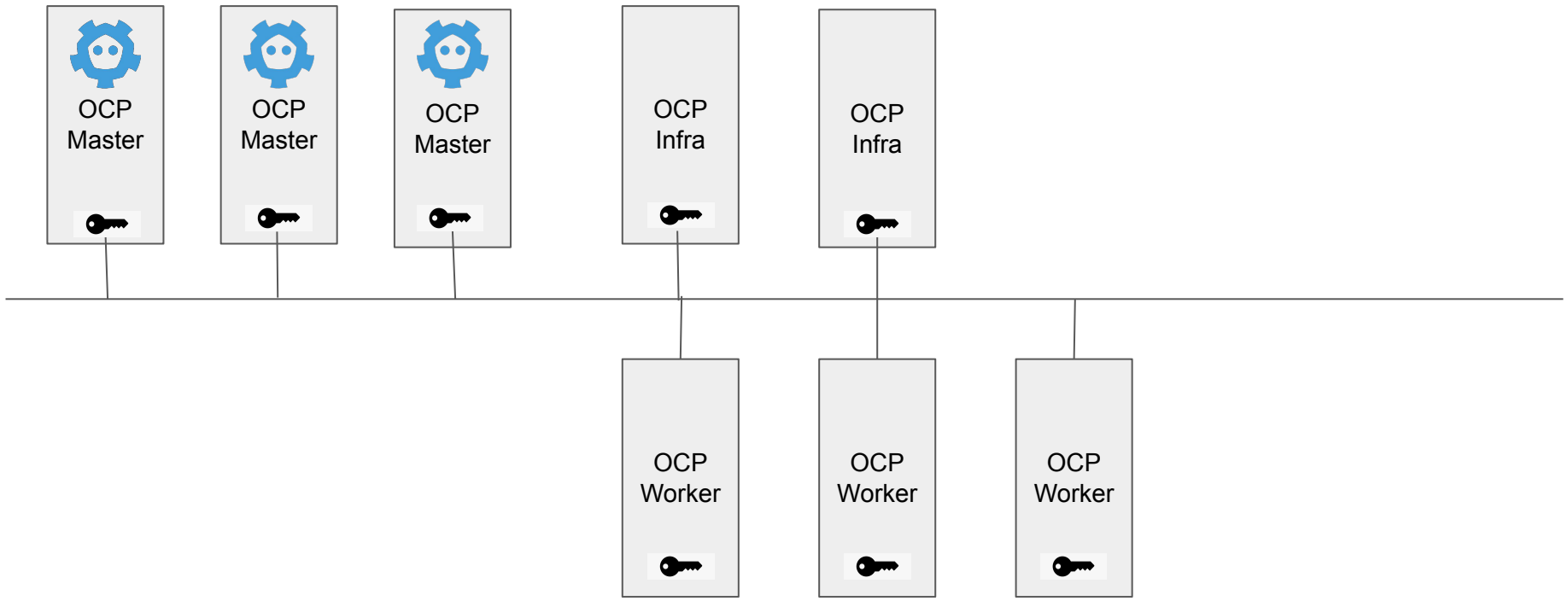
Encrypting the OCP Network traffic and the etcd Database



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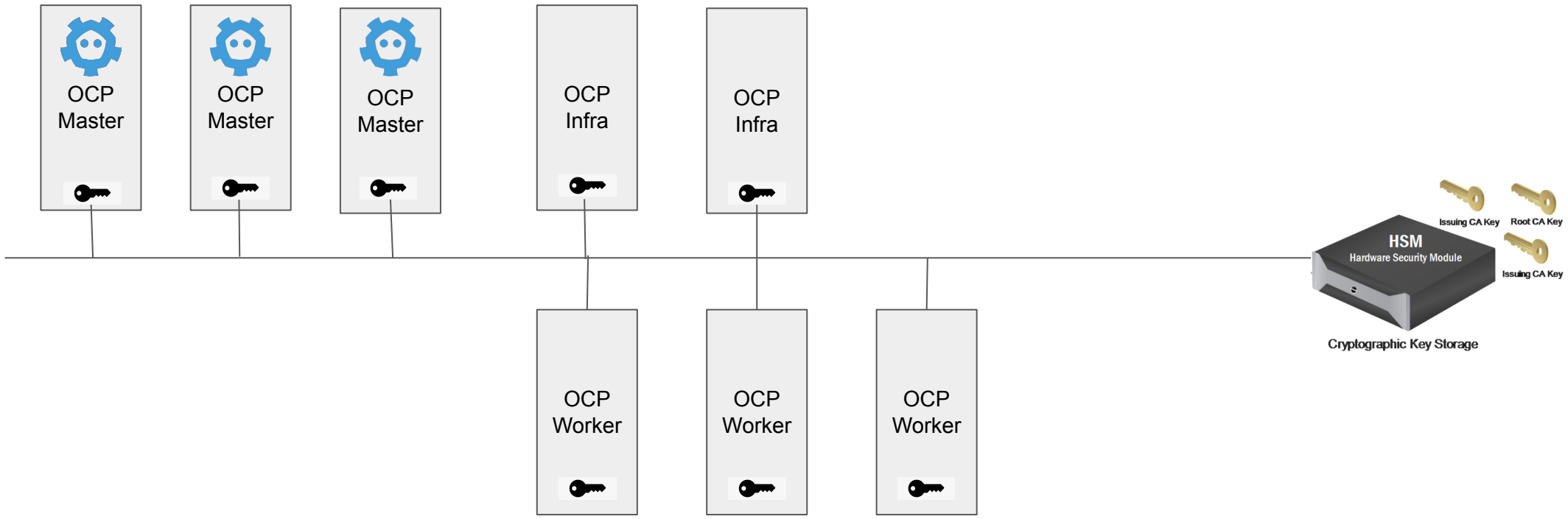
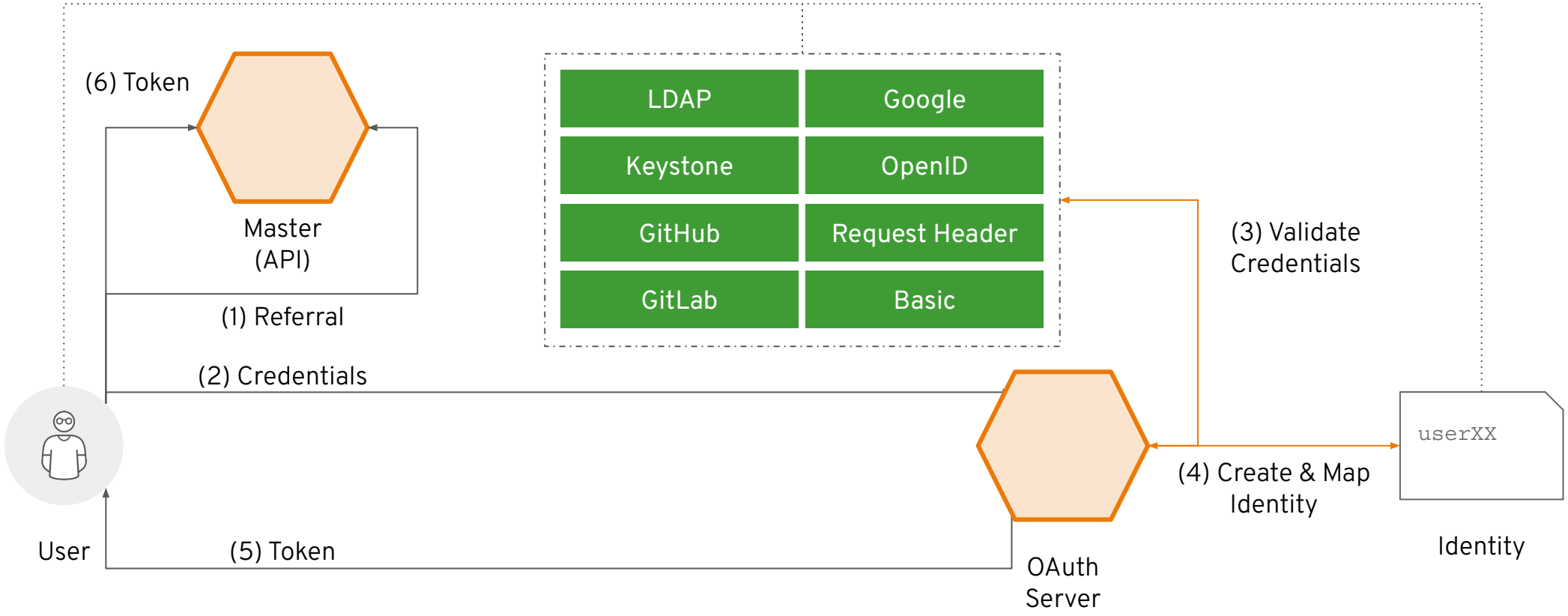


Identity and Access Management

Identity and Access Management



Fine-Grained RBAC

- Project scope & cluster scope available
- Matches request attributes (verb,object,etc)
- If no roles match, request is denied (deny by default)
- Operator- and user-level roles are defined by default
- Custom roles are supported

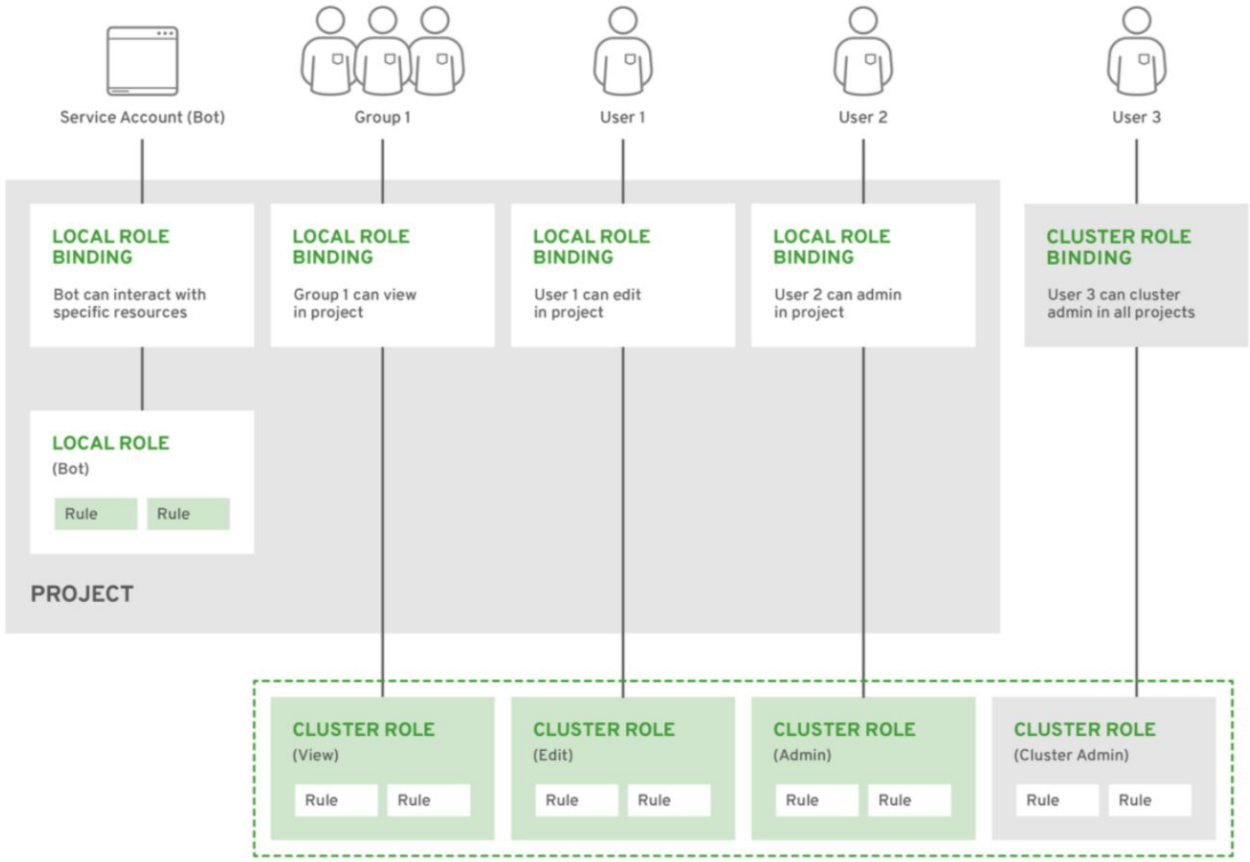


Figure 12 - Authorization Relationships

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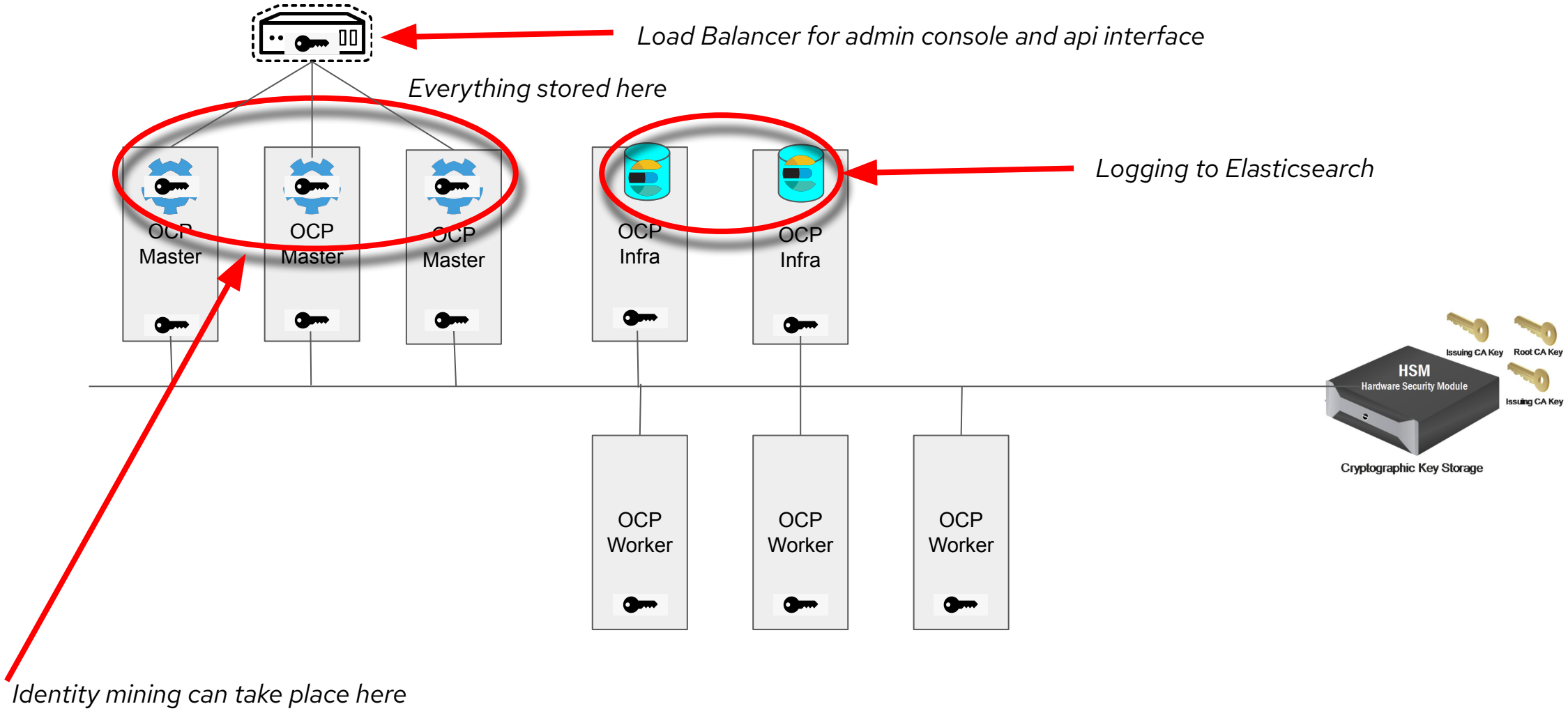
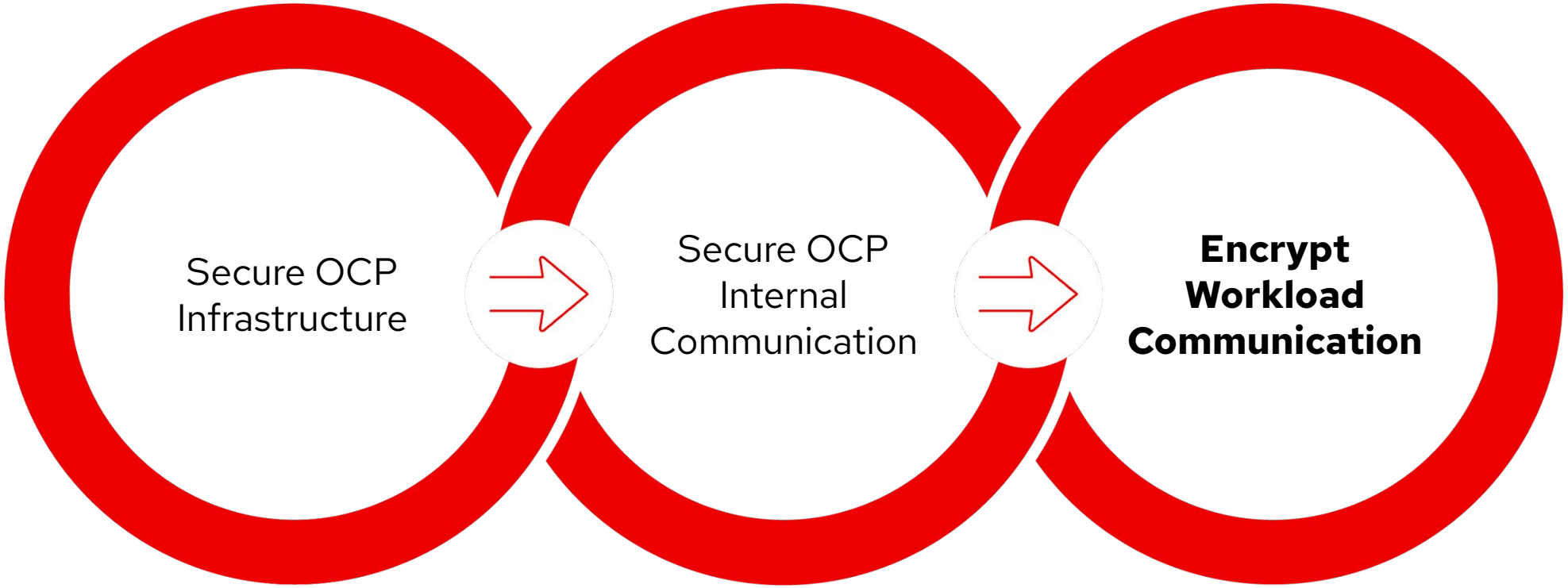
Identity Mining and SIAM Mining

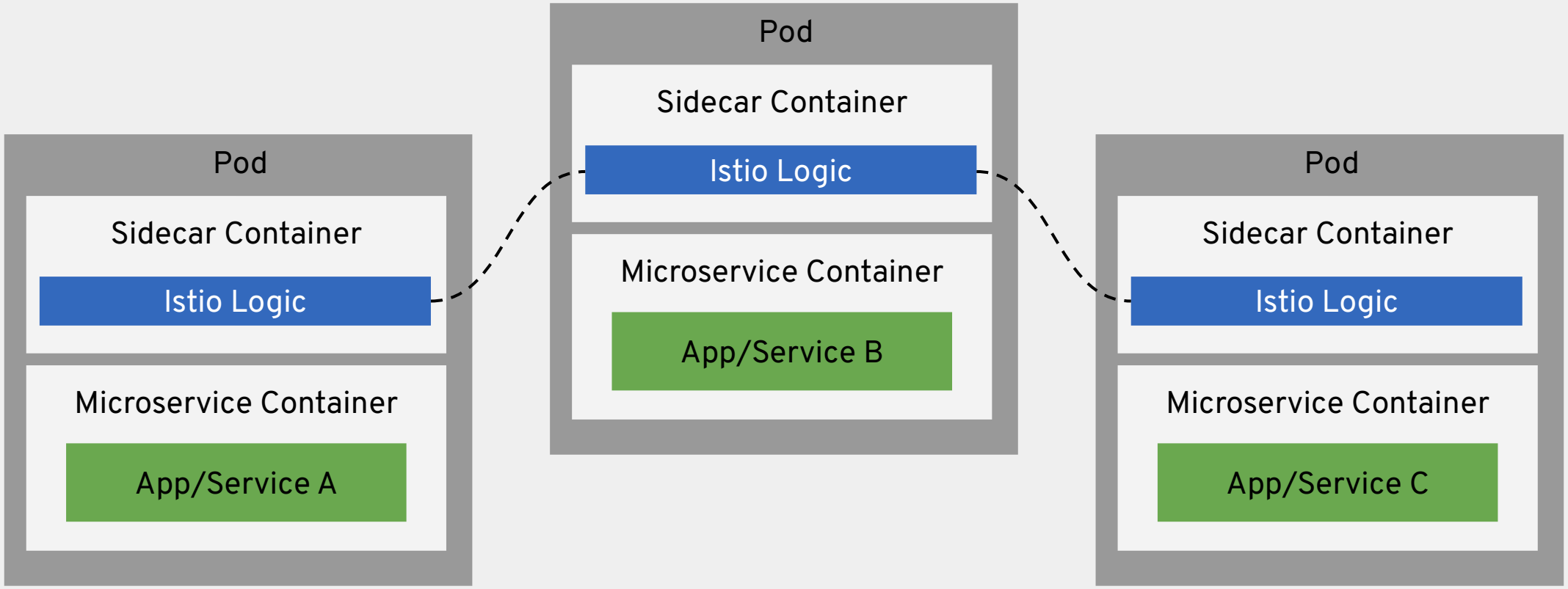


PKI in OpenShift



MICROSERVICES WITH ISTIO

connect, manage, and secure microservices *transparently*



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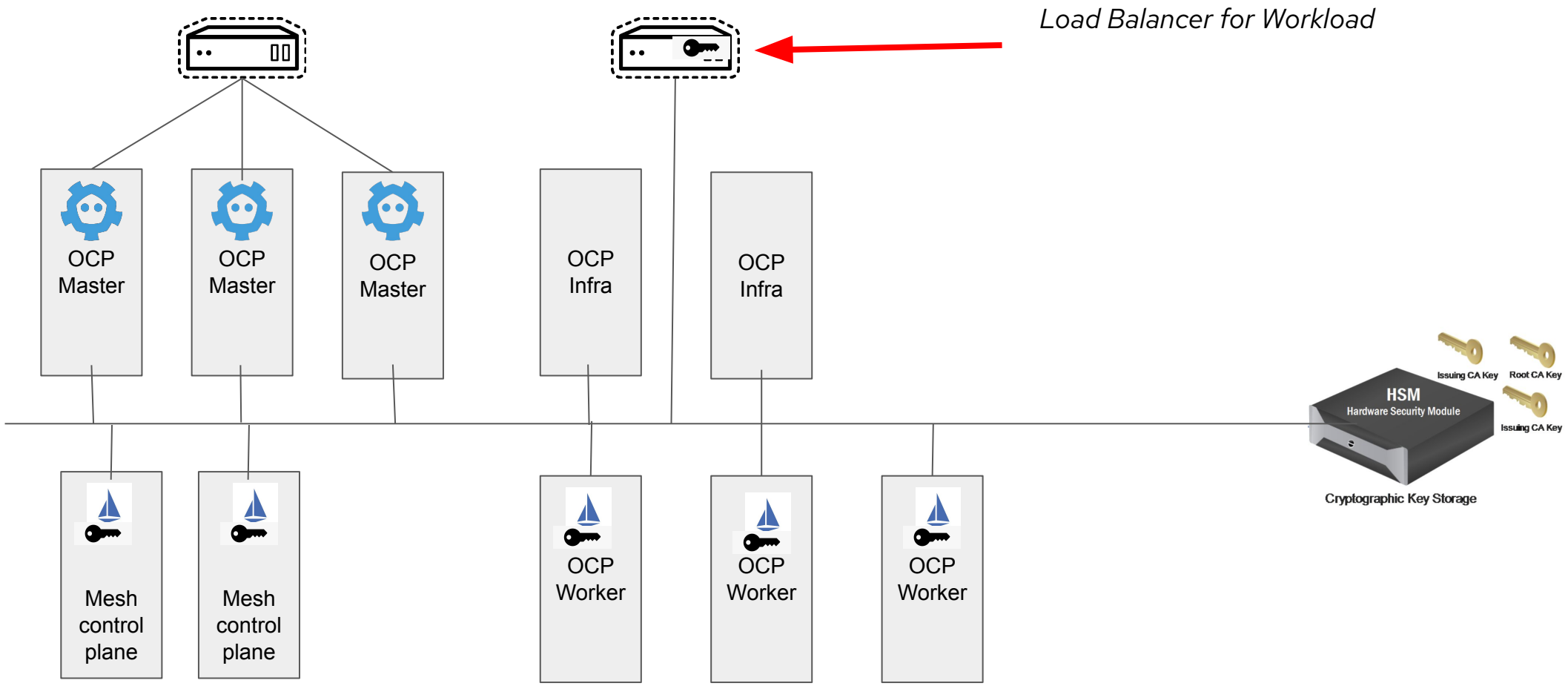
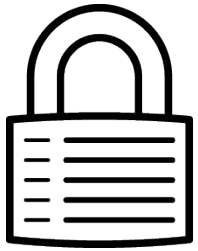

Load Balancer for Workload
OCP Master
OCP Master
OCP Master
OCP Infra
OCP Infra
Mesh control plane
Mesh control plane
OCP Worker
OCP Worker
OCP Worker
Issuing CA Key
Root CA Key
HSM
Hardware Security Module
Issuing CA Key
Cryptographic Key Storage

Stronger Platform Security

Defense in Depth



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Thank you !

Please give me a little feedback

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Thank you

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