Security Best Practices

for Amazon Elastic Kubernetes Service (EKS)

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Containers

Agenda

How do you solve a problem like containers?
EKS Shared Responsibility Model & Security Pillars
Security best practices

- Hosts
- Container images
- Identity and Access Management (IAM)
- Network
- Pod and runtime
- Auditing and forensics

Closing thoughts

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Challenges posed by containers

Processes running on a shared kernel

Isolation implemented by Linux namespaces and cgroups

Short lifespans

Traditional/legacy security software is rarely container-aware

- Firewalls
- IDS/IPS
- DLP
- Forensics

Warrants a different approach

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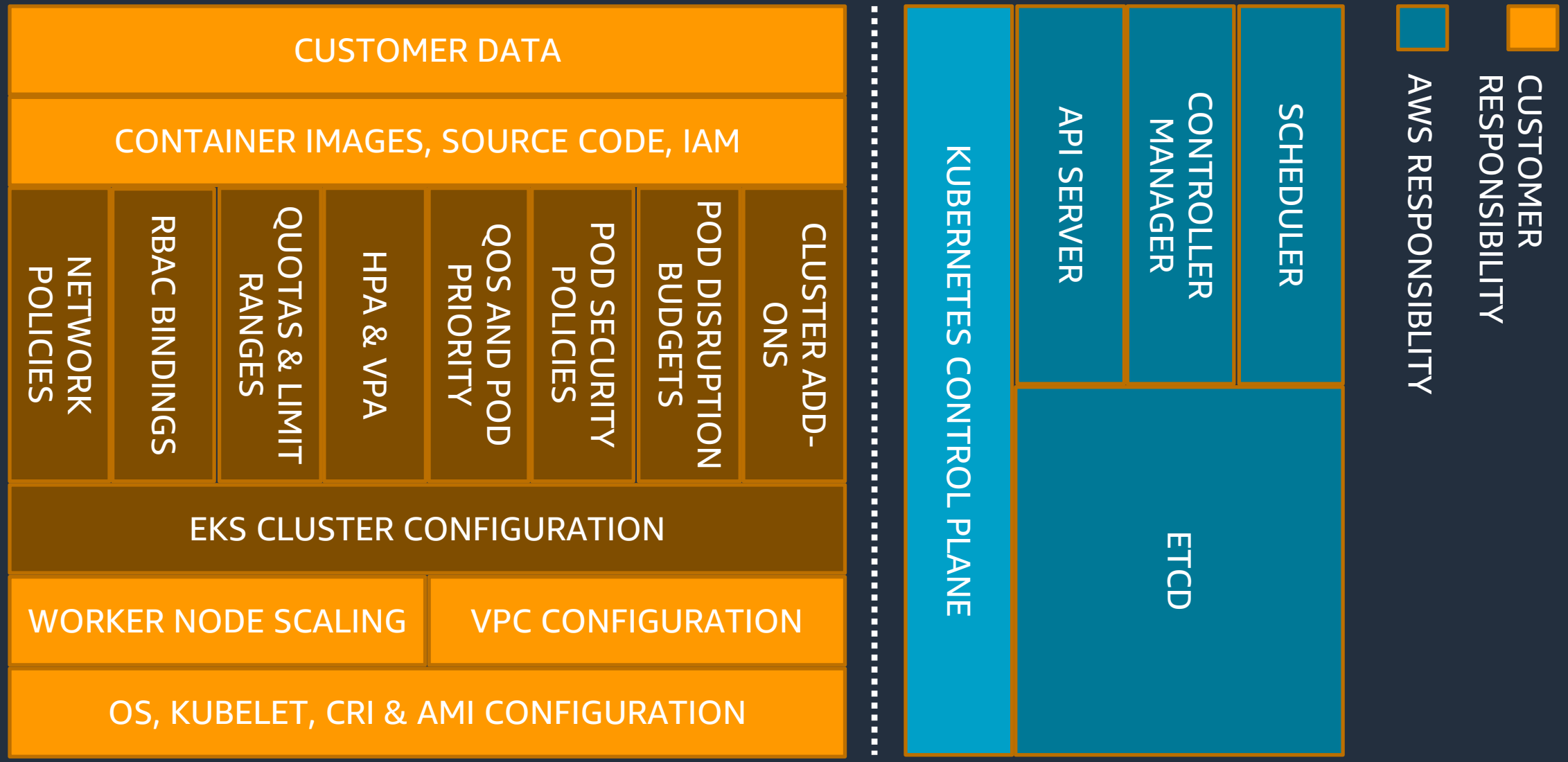
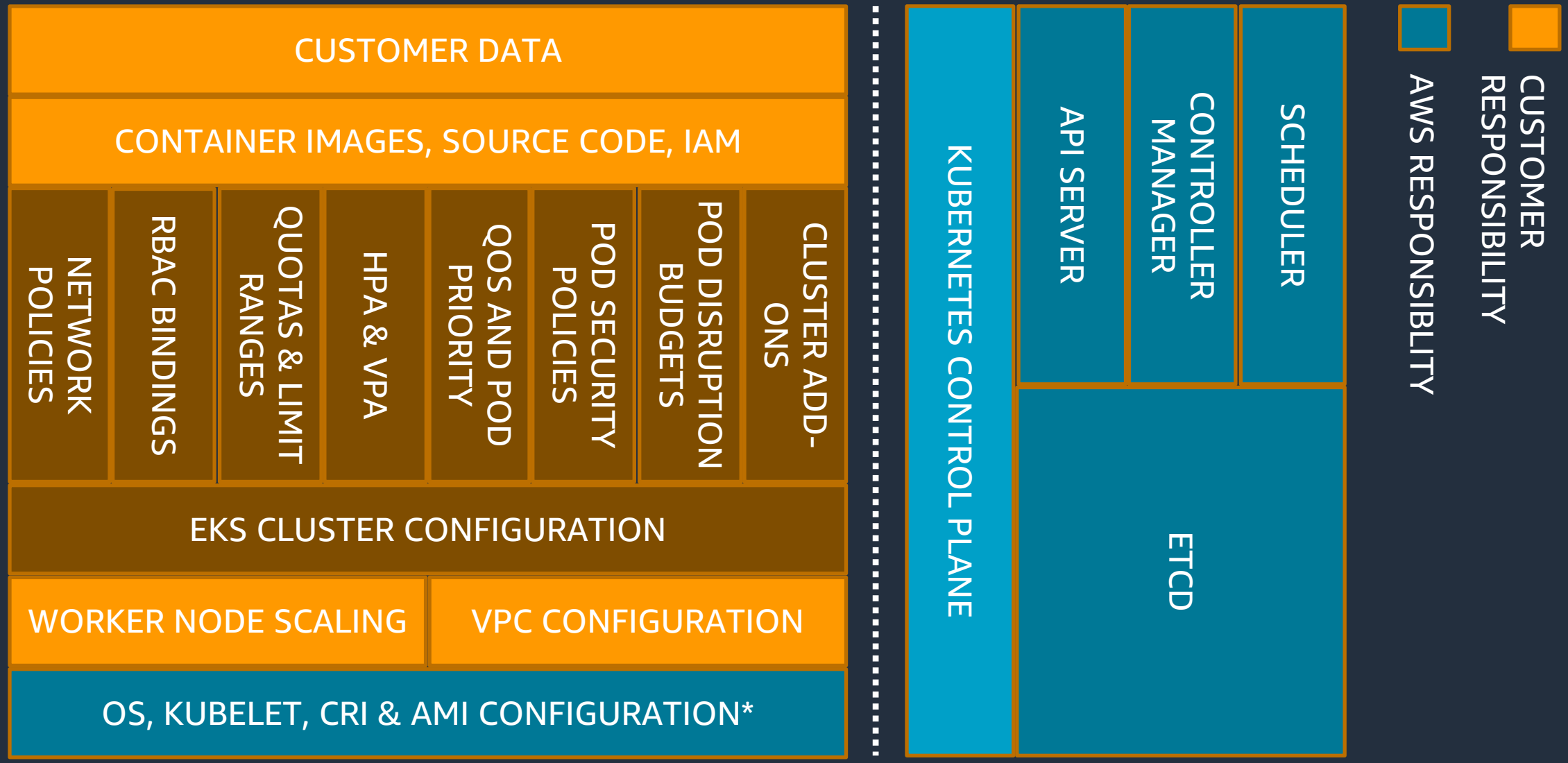
Shared Responsibility Model

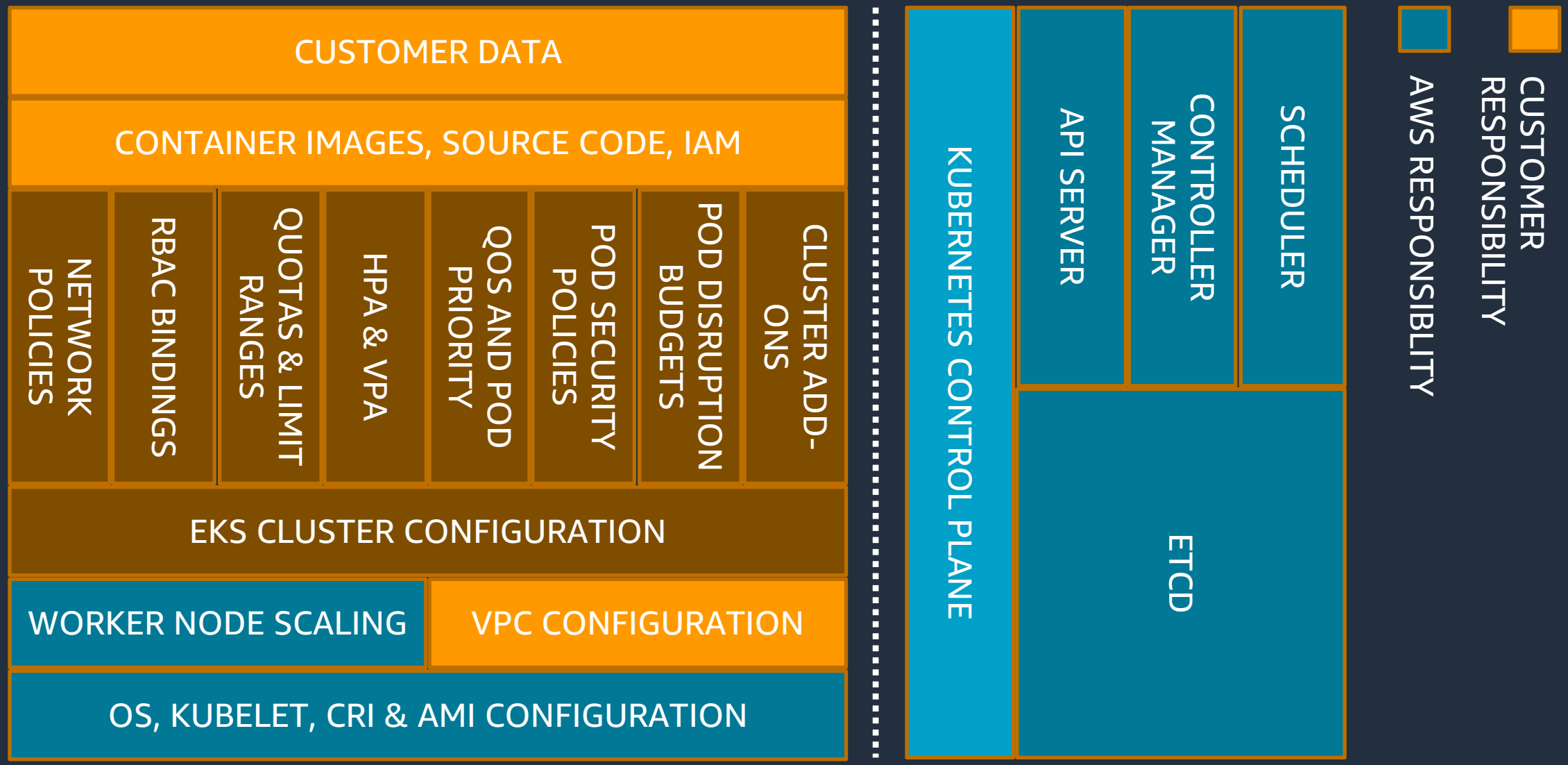
EKS with self-managed workers



EKS with managed node groups (current)



EKS Fargate



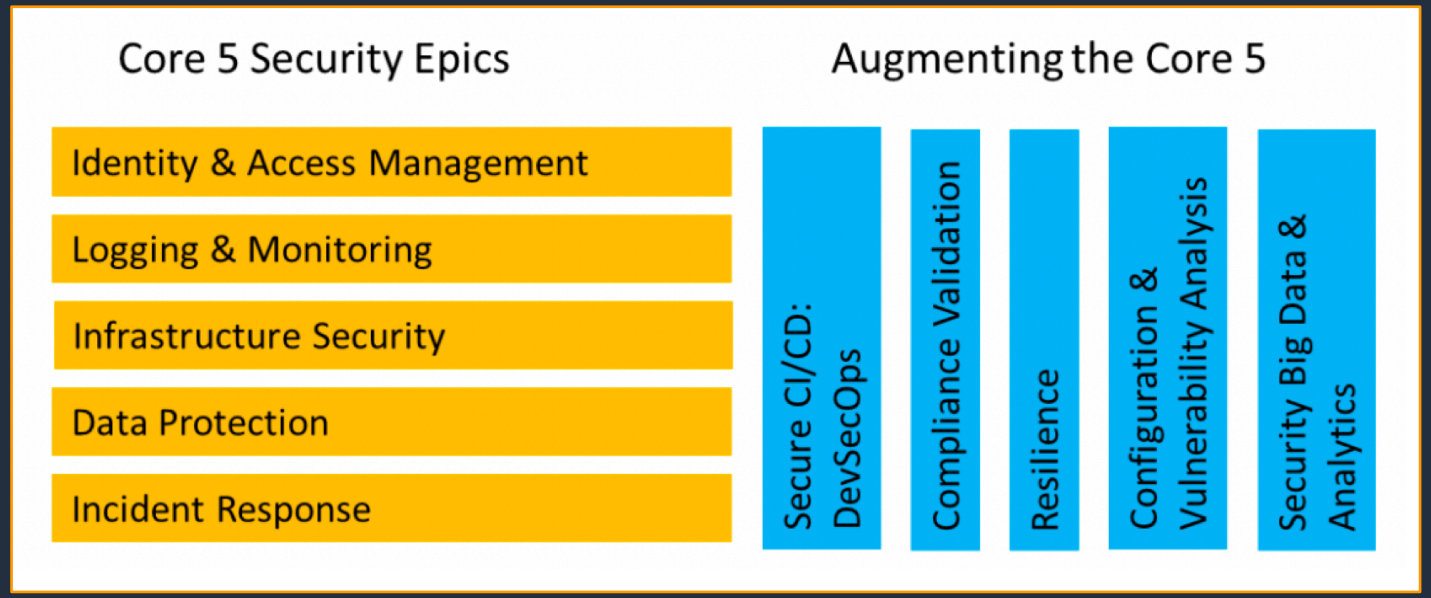
Security Pillars

Container security tenets and epics

Tenets

- All-encompassing
- Shared responsibility
- Cloud native

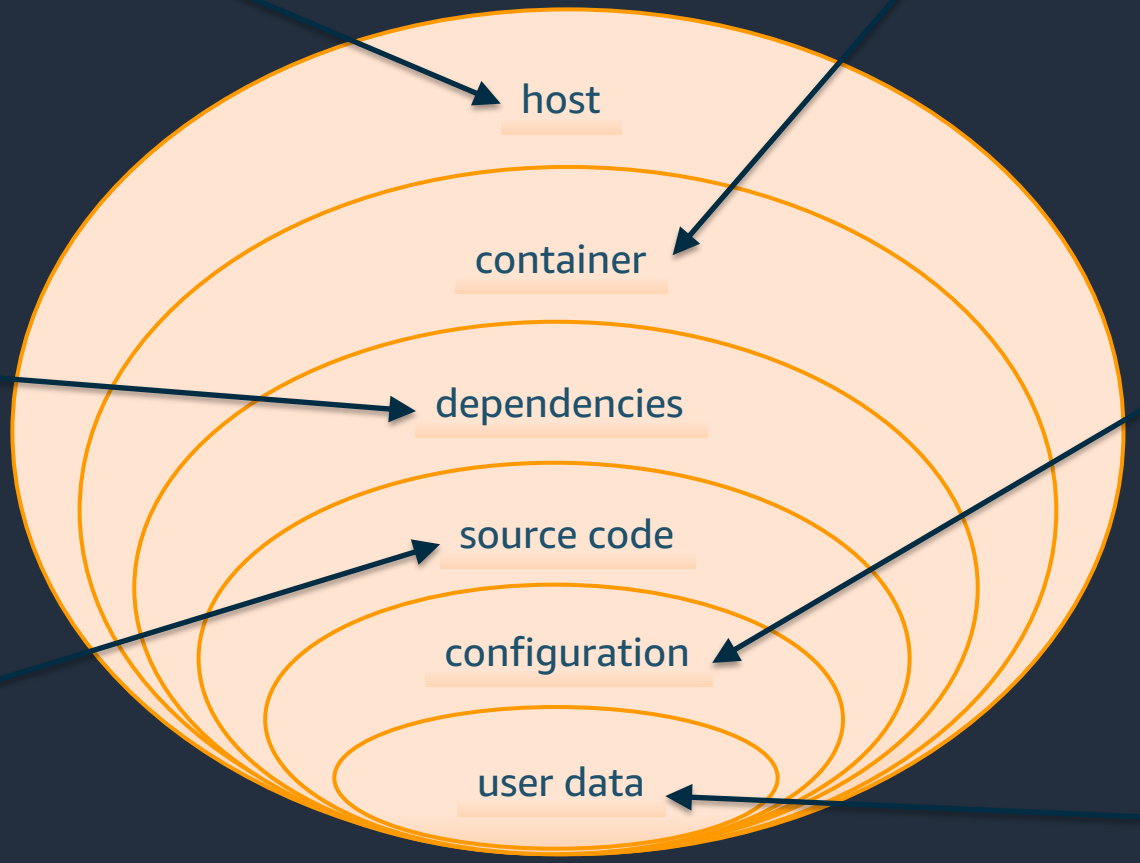
Epics



Container security onion model: defense in depth

- full blown distro (AL2) vs. container-optimized distribution
- multi-tenancy requirements
- **gotchas**: Linux packages/CVEs, leaks, GDPR (in Europe)

- runtime/standards (OCI)
- immutability of images
- all containers share a kernel (mitigation: Firecracker)
- **gotchas**: unnecessary privileged users, no scans, trust



- code analysis
- source available?
- **gotchas**: huge surface, many languages

- sensitive config (passwords, API keys, etc.)
- **gotchas**: commits-to-source, non-separated access (dev has cleartext password)

- sanitizing user input
- static code analysis
- **gotchas**: log-leaking

- business core data
- Personal Identifiable Information (PII)
- **gotchas**: leaks, GDPR (in Europe)

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EKS Best Practices for Security

Host Security

Use an OS that is optimized for running containers

- EKS Optimized Amazon Linux 2 & Bottlerocket (preview)
- Alternatives: Atomic, Flatcar Linux, RancherOS

Deploy workers onto private subnets

Run Amazon Inspector to continually assess alignment with best practices and compliance requirements

- kube-bench
- EKS CIS benchmarks

Minimize and audit access

- SSM

Use SELinux (RHEL & CentOS)

- Audit2Allow, Audit2Why, SEAlert

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Securing container images

Scan container images

- ECR, Anchore, Clair, Trivy

Use Scratch or a slim base layer

De-fang your images

- Remove files with the SETUID and SETGID bits from the image

Always run as a non-root user

- Lint your Dockerfiles

Use endpoint policies and private endpoints with Elastic Container Registry (ECR)

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Identity and Access Management (IAM)

General guidelines

- Practice the principle of least privilege for AWS IAM and k8s RBAC
- Configure EKS cluster endpoint to be PRIVATE
- Periodically audit access to the cluster

IAM

- Use IRSA to assign AWS identities to pods
- Block access to EC2 metadata

Kubernetes

- Use separate services accounts for each application
- Disable mounting of the default SA token

Network security

Allow all traffic is the default policy

Use k8s network policies for restricting E-W traffic within the cluster

Start with a deny-all global policy and incrementally add policies

- Port 53 (DNS) egress to kube-system
- Allow all within a namespace

Restrict outbound traffic from pods that don’t need to connect to external services

- SGs for pods & Cilium (L7 policies)

Encrypt service-to-services traffic with a mesh

- Alternatives: Select CNI plug-ins & Nitro instances

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Pod and runtime security

Use PSPs or OPA/Gatekeeper to implement runtime security measures:

- Deny privileged escalation
- Deny running as root
- Deny mounting hostPath
- Drop Linux capabilities

Compliment PSPs with AppArmor or Seccomp profiles (if necessary)

Use 3rd party solutions

- Aqua, Stackrox, Sysdig Falco, Twistlock

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Auditing and forensics

Enable control plane logs

Stream logs from containers to an external log aggregator

Periodically audit Kubernetes control plane and AWS CloudTrail logs for suspicious activity

- Search for the annotations `authorization.k8s.io/decision` and `authorization.k8s.io/reason` to ascertain why a call was allow/denied

Immediately isolate pods you suspect have been compromised

- Remove/change labels
- Create network policy to isolate the pod

Cordon the instance (if necessary)

- Capture volatile artifacts on the worker node, e.g. memory, disk, etc.

kube-forensics

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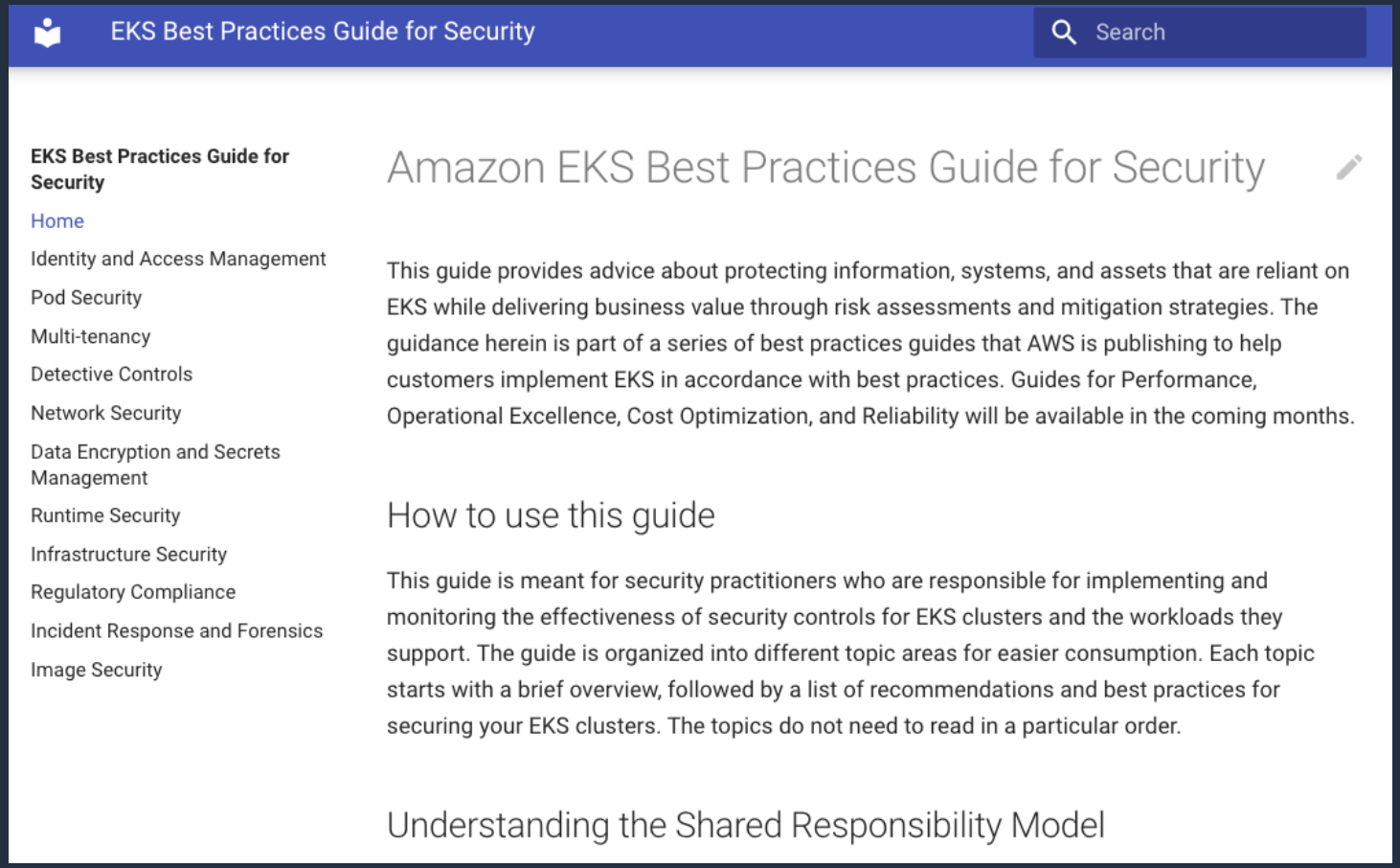
Closing thoughts

- Security is everyone’s responsibility
- Understand the shared responsibility model
- Shift left & DevSecOps

EKS Best Practices for Security



https://aws.github.io/aws-eks-best-practices/

Thank you!