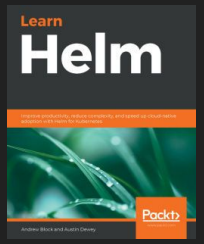

DevNation
Kubernetes in the Enterprise
Red Hat
Developer

Andrew Block

- Distinguished Architect, Red Hat
- Specialities
  - Container and cloud technologies
  - Automation
  - Integration
- Enterprise experience with organizations large and small
- Designed and developed reference architecture on cloud native patterns
- Published author - Learn Helm



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Why Kubernetes?

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Containers/Microservices

Model for packaging operating system and application in a single atomic unit and decomposing them into smaller units of work

Scalability

Leverage the elastic compute capabilities provided in the cluster to increase or decrease as necessary

Container Management

Declarative based configuration model along with handling the lifecycle of containers

It's Popular

Kubernetes dominates the container orchestration market with contributions from over 130 organizations

But, have you thought about.....?

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- Security
- Storage
- Monitoring and Metrics
- Logging
- User Experience
- Compliance
- ...

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So....

You want to deploy Kubernetes in the Enterprise


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A Brave New World

Containers are a Disruptor

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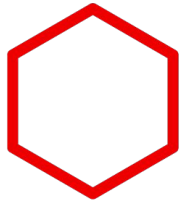
Containers transforms how applications are obtained, developed and used

- Immediate access to a wide range of applications and services
- Can be destroyed and recreated as necessary
- New design patterns have been introduced
- Applicable for use by developers and infrastructure administrators

```
$ podman run -it --rm busybox
```

"Containers are the Napster of the 21st century"



Applying Kubernetes patterns and technologies can be difficult for many organizations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Security

Kubernetes Ecosystem

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Organizations want a detailed list of components that are part of any software stack

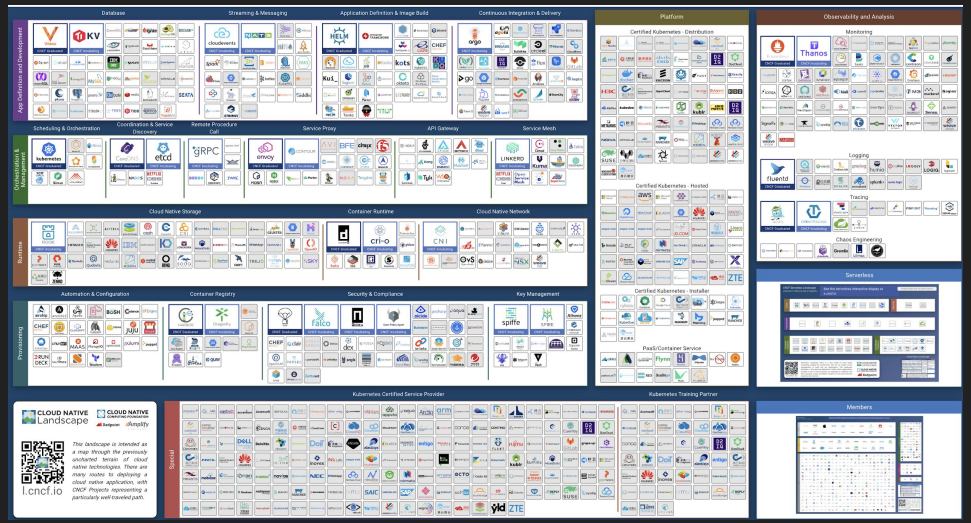
Support

Compliance

Vulnerability Assessment

Cloud Native Landscape is Vast

- Understand the core components of any Kubernetes deployment
- Determine set of additional components to support cloud native development and operations
- Engage with key representatives to understand their concerns and goals



CNCF Landscape

Kubernetes Platform and Security Concerns

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What are some of the top concerns to be aware of?

- Containers
- Kubernetes Control Plane
- Access Control
- Certificates
- Networking
- Storage

Engage Security Team Early and Often

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- Security team typically needs to sign off on any enterprise implementation
- Kubernetes introduces technologies that security teams have may not be familiar with
- Collaboration encourages DevSecOps
- Can result in the overall failure of the implementation if not approached correctly


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Platform

Some Assembly is Required

Kubernetes provides the base platform for running containers at scale

The rest is up to administrators and consumers.....

Supporting Services

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Additional components required for a full Kubernetes deployment

- Areas of concern
  - Logging
  - Platform and application monitoring
  - Alerting
  - Continuous Integration and Continuous Delivery
  - Secure values

- Many existing services have added support for Kubernetes deployment

Supporting Services

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Avoid building your own implementations

- Limited number of developers/features
- Difficult to manage over time
- Lack of community support
- The majority of attempts eventually fail

Image Management

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Container images are a foundational components of a Kubernetes deployment

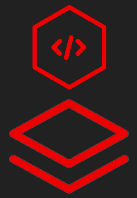

Image Composition

Types of images that should be allowed to be run within an organization

Image Sources

Most organizations do not allow direct retrieval from public image registries such as Docker Hub

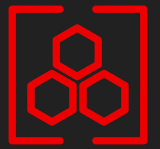

Image Registry

Images produced within the organization must be stored in an image registry

Managing Images in the Enterprise

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Image Import Pipeline

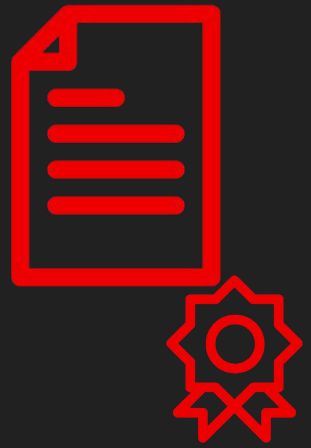
- Develop and implement a process for sourcing images from external registries
- Scanning of images should be implemented to verify content does not contain active vulnerabilities

Develop Base Images

- Determine common programming languages and patterns that will be deployed to the platform
- Package required enterprise software
- Ensure images are readily available
- Keep images up to date

Certificates

- Kubernetes makes extensive use of PKI
- Most organizations have their own Certificate Authority that creates and manages certificates
- Develop a process for managing infrastructure and application certificates



Networking

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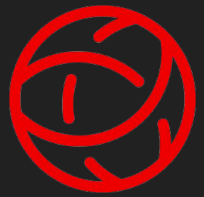
Kubernetes Networking

- Identify IP address ranges needed for deployment
- SDN plugin can accelerate or limit what can be achieved by the cluster

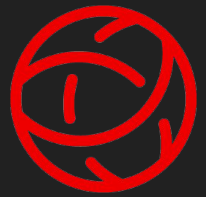
It's Always the Proxy...

- Most organizations have a firewall/proxy to govern access to external resources
- Network proxies can interfere with intracluster as well as external communication



Additional Concerns

- Determine ingress and egress methods along with source/destinations
- Dependencies on supporting services, such as storage



Storage: The fallacy of Microservices

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No matter the hype, storage will be required to support the platform and end user applications

- Plan ahead
- Investigate newer cloud native compatible storage
- Integration with existing storage backends typically required
- Lift and shift application to cloud presents greatest challenge

Defend the Platform

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Proactive actions mitigate threats and streamline responses to issues

- Employ principle of least privilege
- Enable various forms of auditing
- Tools, such as Open Policy Agent/Gatekeeper can enforce policies and reject malicious actions
- Understand monitoring and alerting capabilities and integrate into existing SEIM systems


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Developer Experience

Life as a Developer

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I just found this great sample application to deploy to the Kubernetes cluster.

This is going to be easy and fun!

We all can’t have nice things

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Security and network restrictions make it difficult to get started

- Cannot create Kubernetes resources
- Cannot access images
- Cannot obtain dependencies
- External runtime resources restricted

Local Development

Most organization provided machines disallow installation and runtime of many components

- Software packages
- Command line tools
- Hypervisors (VirtualBox, Hyper-V)
- Container runtimes
  - Docker
  - Podman
- IDE's
- Development tooling

Local Development

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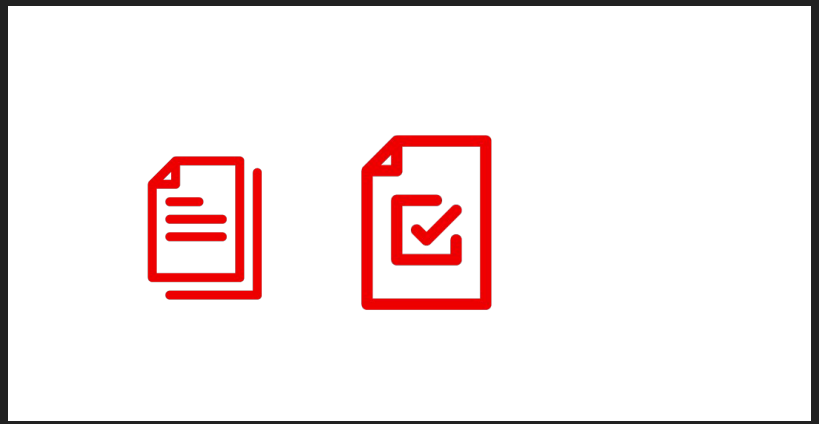
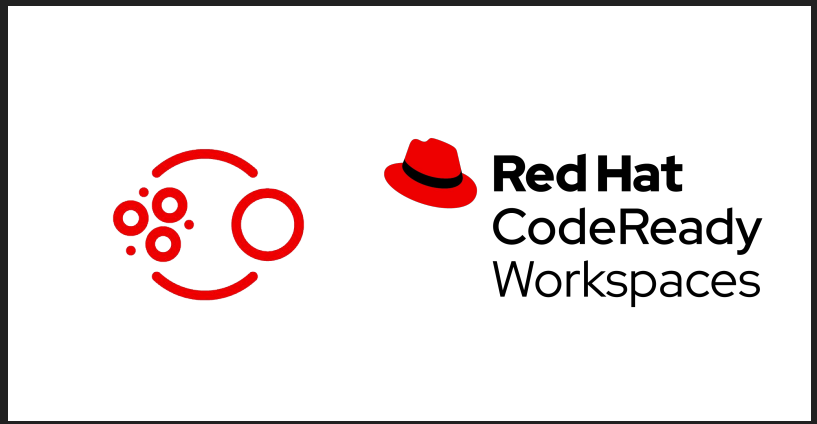
Implement processes for enabling developer productivity

- Software available in enterprise repository
- Documentation and automation



Investigate new development methodologies

- Containerized development
- Cloud based IDE's



Resource Management

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Kubernetes requires developers to truly understand their applications and any requirements

- Replicas
- LimitRanges and Quotas
- Autoscaling
- Scheduling options


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The Organization

Outside of the Comfort Zone

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Kubernetes introduces new roles and responsibilities

DEVELOPERS

- New languages and frameworks
- Infrastructure concerns
- Full stack ownership

DevOps is hard!

OPERATIONS

- Shift from managing servers to managing containers
- Infrastructure as Code
- Interaction with development teams

Organizational practices are exposed

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Assessment to introduce Kubernetes often uncovers unflattering organizational practices

- New or existing processes are reviewed in order to align with Kubernetes common procedures
- Can include insecure or forbidden actions
- Unnecessary blame placed on Kubernetes as it triggered assessment

Marketing the Platform

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Awareness of the platform and its benefits drives adoption

- Typically introduced to an organization by an infrastructure team
  - Can get lost in a large, siloed organization
- Make the platform approachable
  - Avoid shadow IT (Other Kubernetes implementations)
- Overall failure of initiative can occur if not managed properly

Build the Community Within

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It takes a village to deploy Kubernetes successfully at Enterprise scale

Documentation

Enablement

Open Communication


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It Doesn't End There...

Kubernetes is a Journey

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- Plan ahead if you intend to implement Kubernetes
- Every organization is at a different point in their journey
    - Not everyone is Netflix!
- Assess level of success within your own organization


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Thank You!