



# Options for Kubernetes on Azure

Workshop



# About BoxBoat

Boutique consulting company focused on helping organizations achieve a DevOps transformation. We are engineers at heart and enjoy solving challenging problems by utilizing cutting-edge solutions through **Kubernetes** and **Automation**.





**boxboat**



# boxboat

an IBM Company

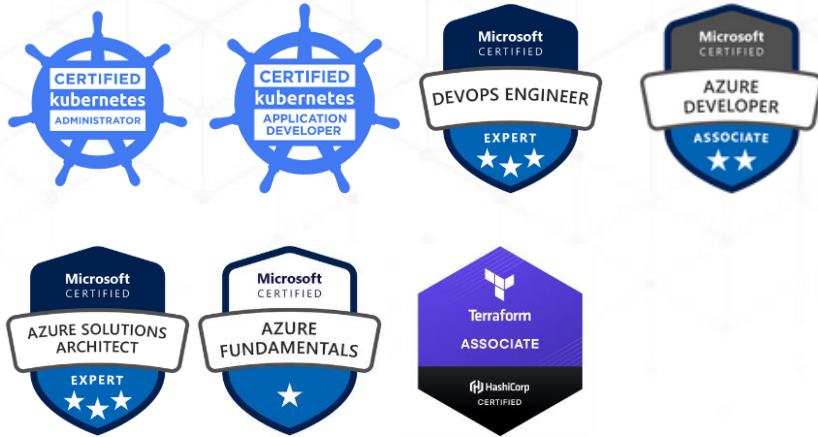


# Who am I?

Facundo Gauna

[facundo@boxboat.com](mailto:facundo@boxboat.com)

Senior Solutions Architect / Azure Practice Lead  
@ BoxBoat Technologies



# Who am I?

Mike Hacker

[mhacker@microsoft.com](mailto:mhacker@microsoft.com)

Azure Application Innovation Specialist

Microsoft State and Local Government

<https://blog.mikehacker.net>





# Who am I?

Nick Miethe

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Solutions Architect / OpenShift Practice Lead @  
BoxBoat Technologies



# Agenda

**Intro**

**Do you need Kubernetes?**

**Intro to Azure Kubernetes Service (AKS)**

**Demo**

**Intro to Red Hat OpenShift (ARO)**

**Demo**

**Do it yourself**

**Q&A / Closeout**

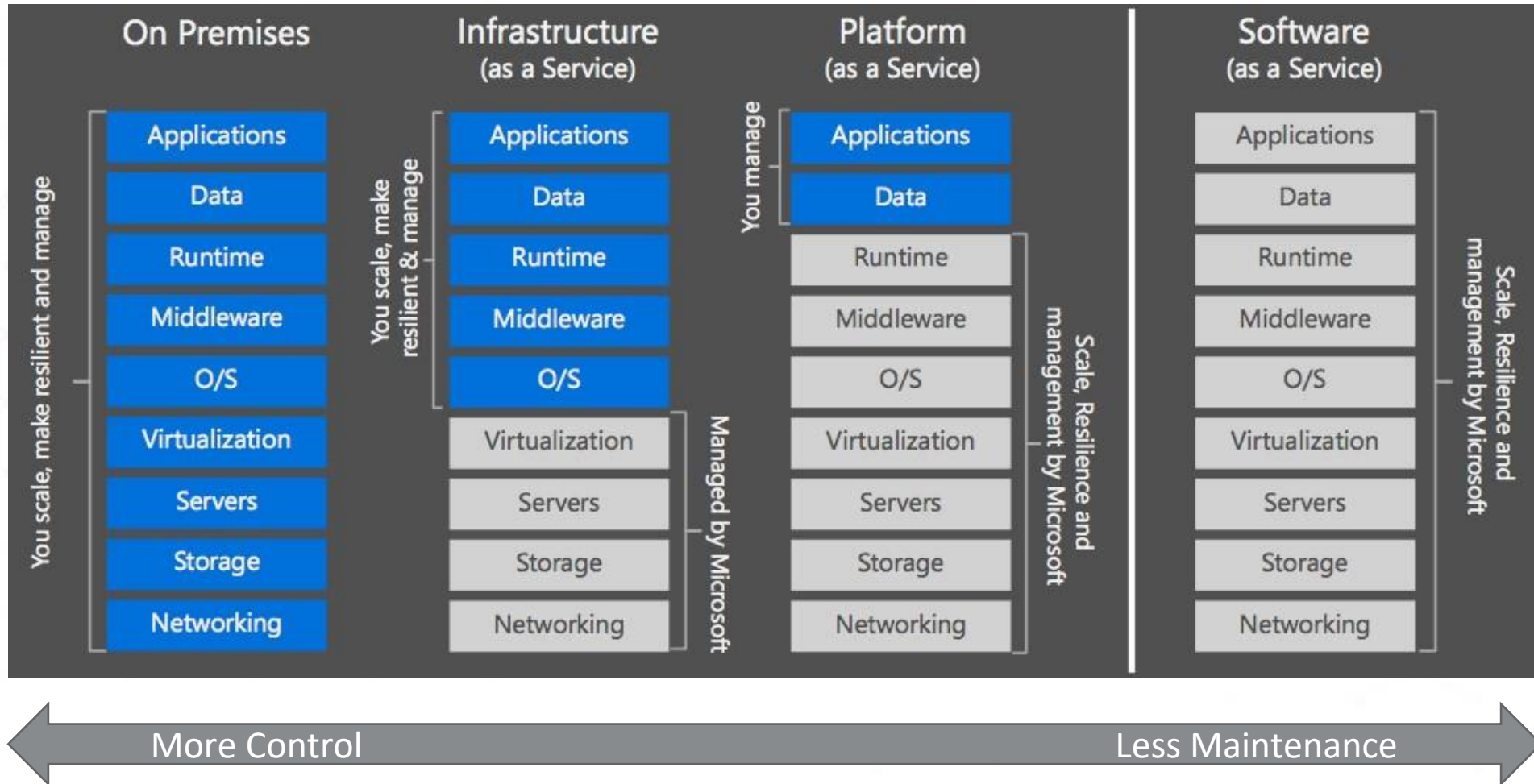




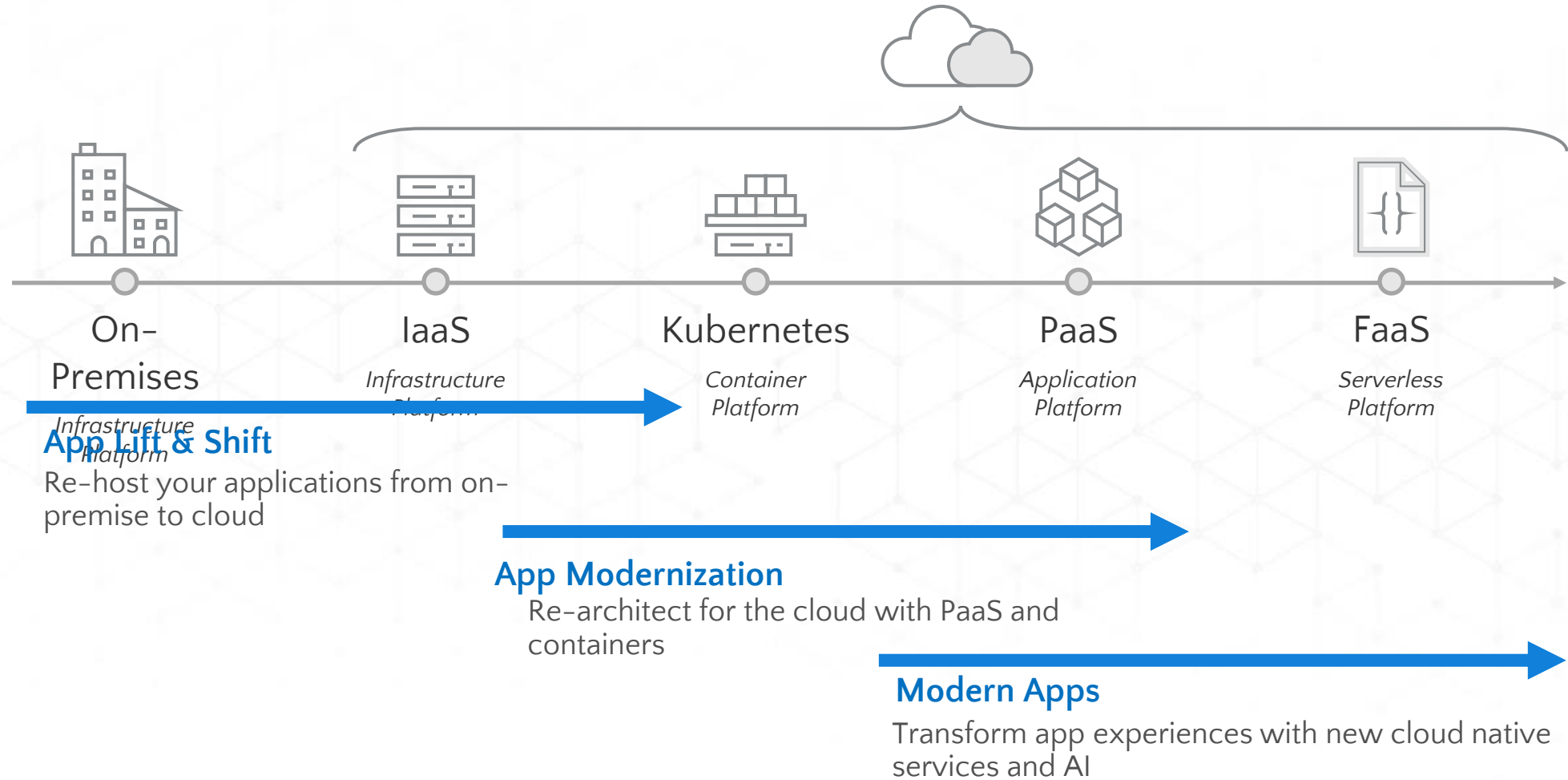
# Do you need Kubernetes?

By Mike Hacker (Microsoft)

# Hosting Models



# Cloud Maturity Scale





# Kubernetes Pros



More control like Infrastructure as Service (IaaS)



High agility like Platform as a Service (PaaS)



Portable



# Kubernetes Cons



LEARNING CURVE



COMPLEX



MORE WORK

# Azure Alternatives

## Platform as a Service

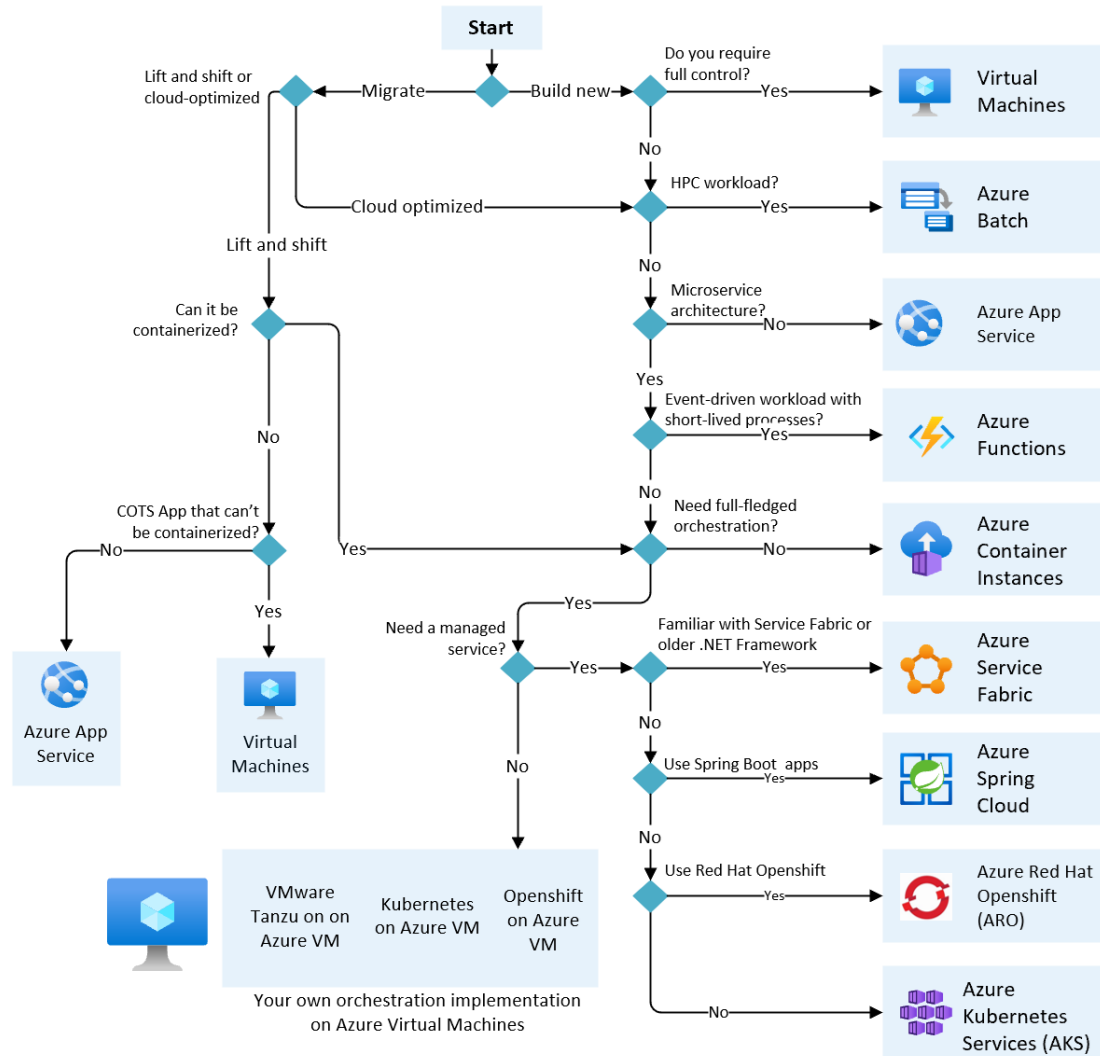
- App Services
- ASEv3
- Spring Cloud

## Serverless

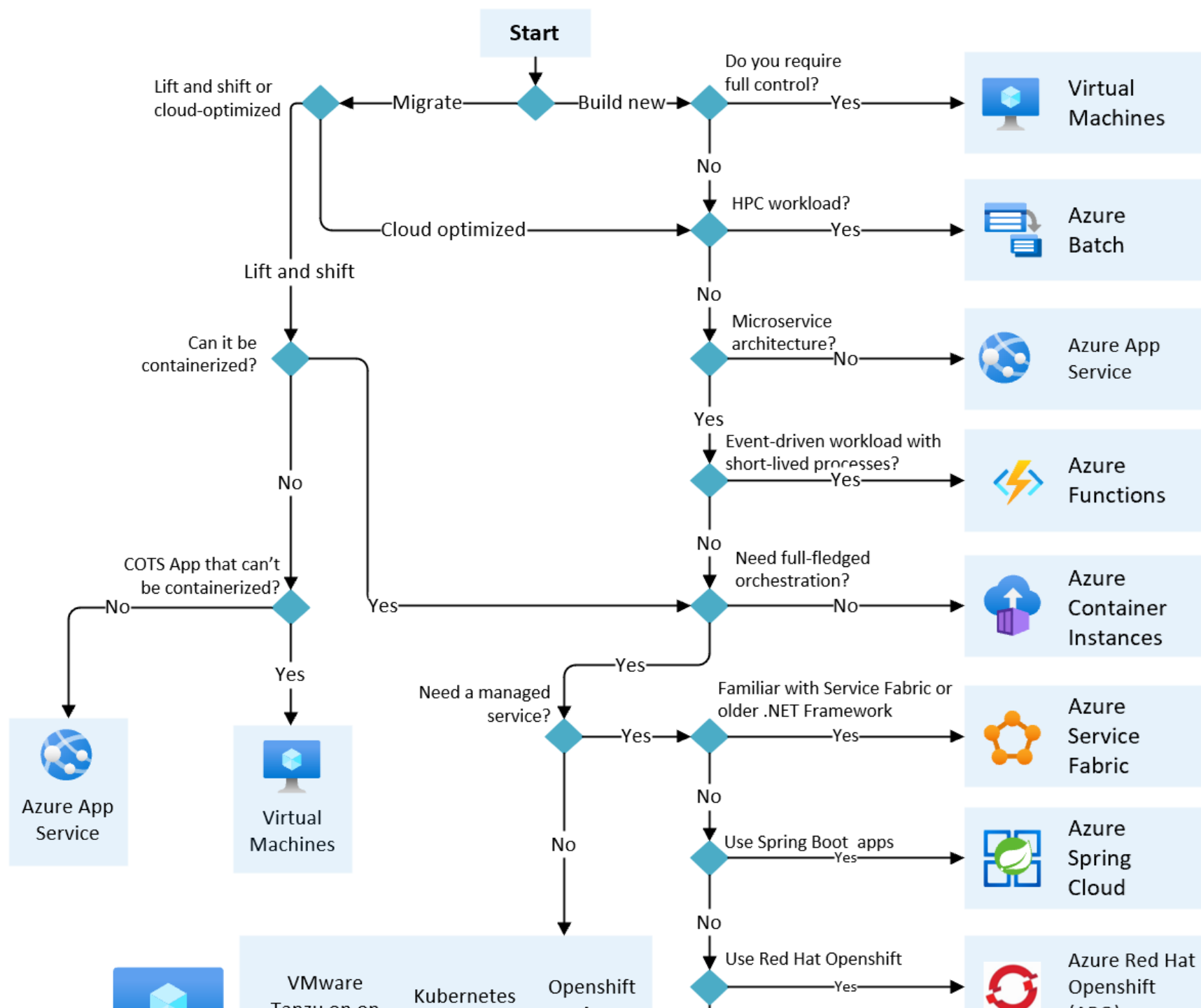
- Azure Functions
- Logic Apps



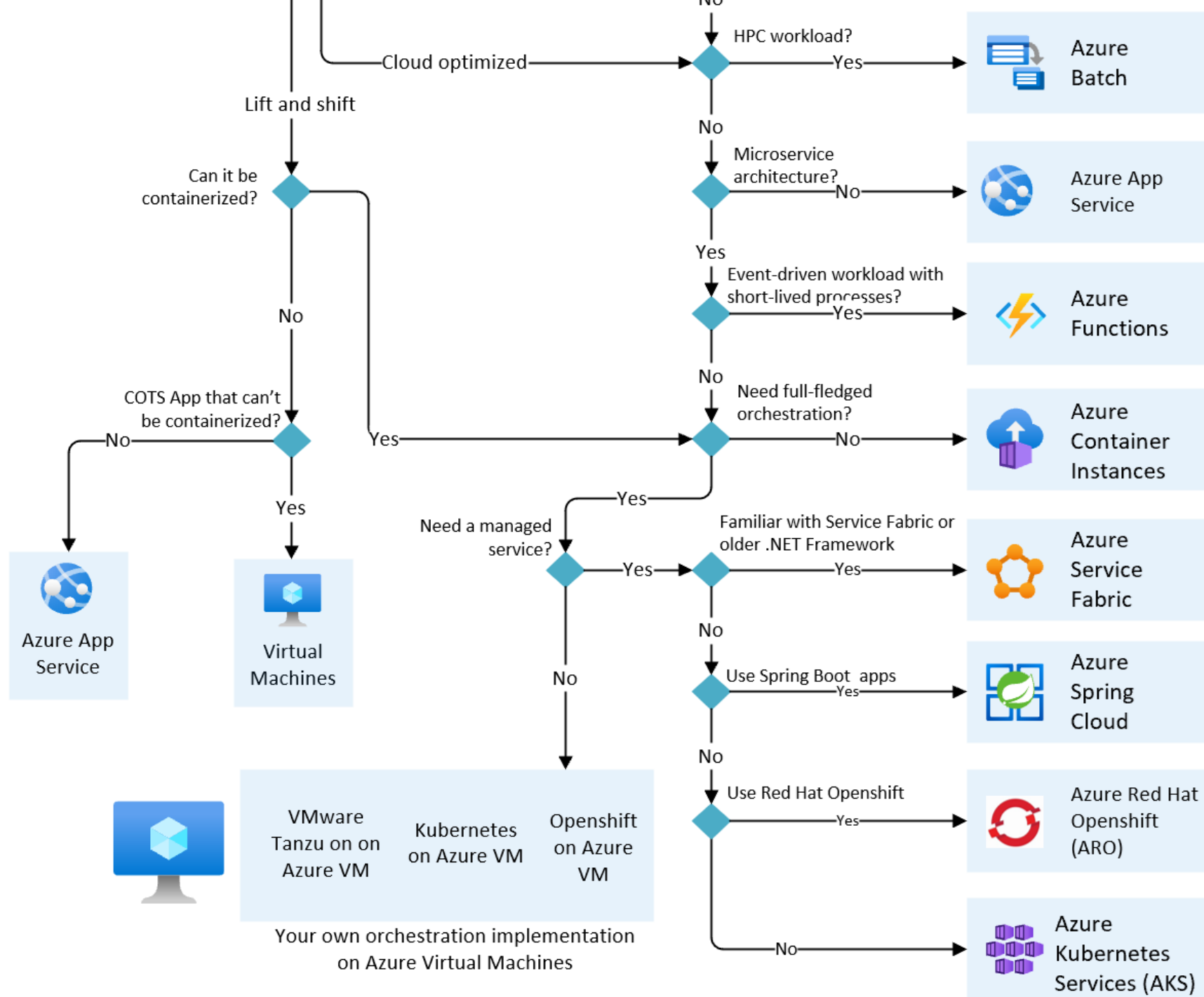
# Hosting Models



<https://aka.ms/azure-decision-tree>









# Azure Kubernetes Service (AKS)

By Facundo Gauna

# Introduction

- An open-source container-orchestration system for automating application deployment, scaling, and management.
- De-facto industry container orchestrator
- Kubernetes is Greek for **helmsman** or **captain**
- Often referred to as “k8s”
- Initial release June 7, 2014
- Heavily influenced by Google’s Borg



# Why?



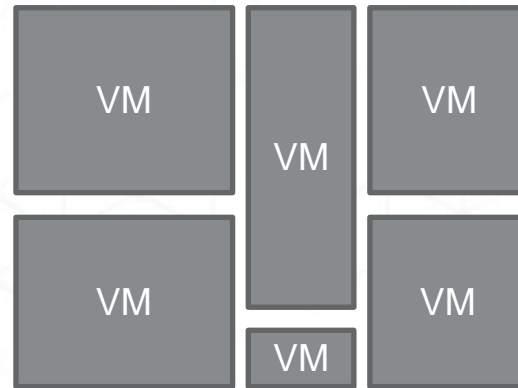
CONTAINERS CREATE  
SCALABILITY CHALLENGES



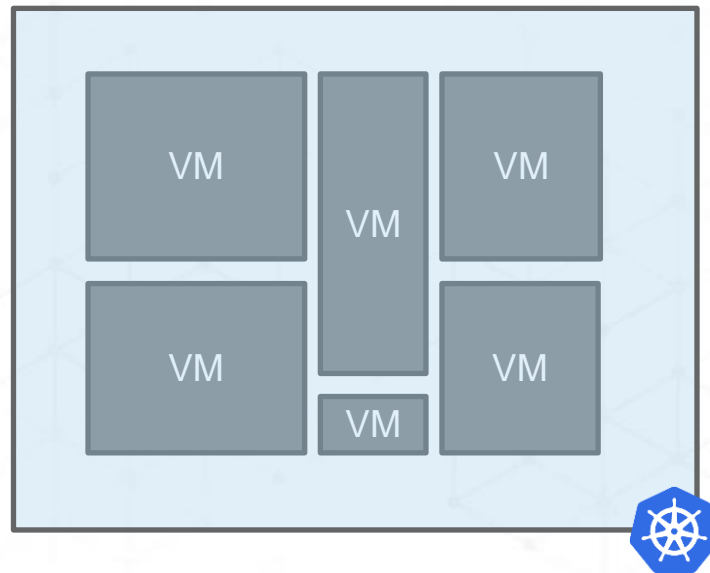
ALLOWS YOU TO VIEW THE  
DATA CENTER AS A COMPUTER



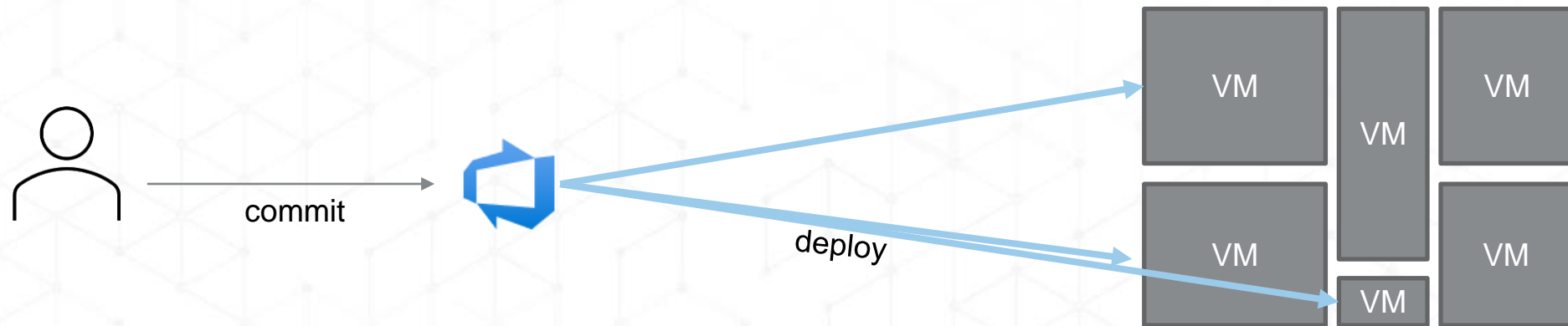
# Traditional data center



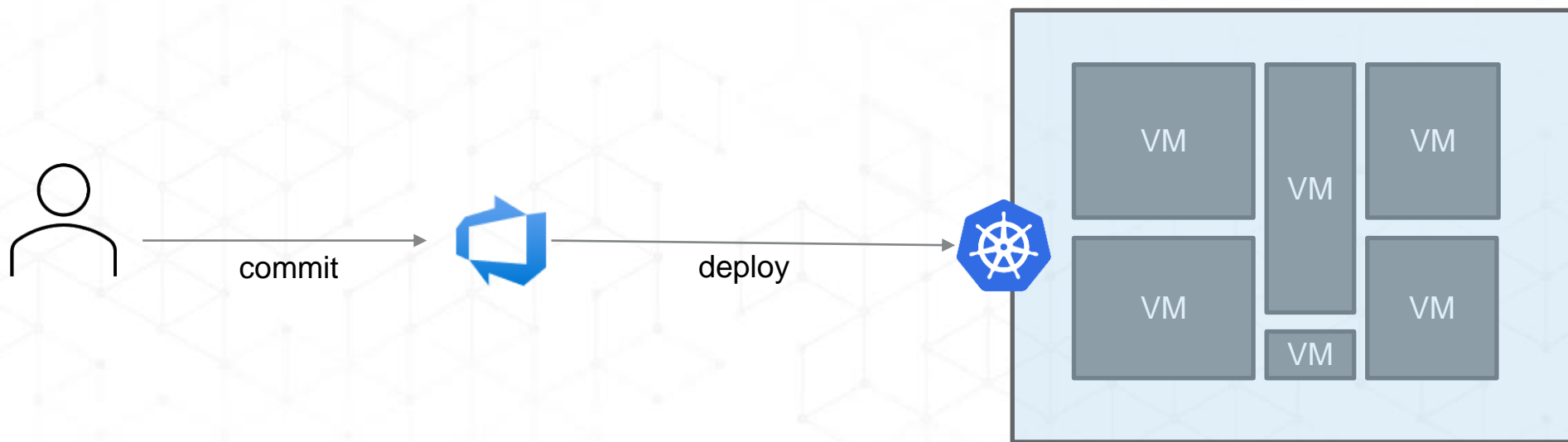
# View the data center as a computer



# Traditional deployments



# View the data center as a computer





# What does Kubernetes do?

## Self-Healing

Provides self-healing capabilities for both hardware and application issues

## Multi-tenancy

Becomes a platform to host multiple applications across the same hardware

## Declarative configuration

Let's you define and configure everything through code (YAML)

# What are common use-cases?

**Microservices**

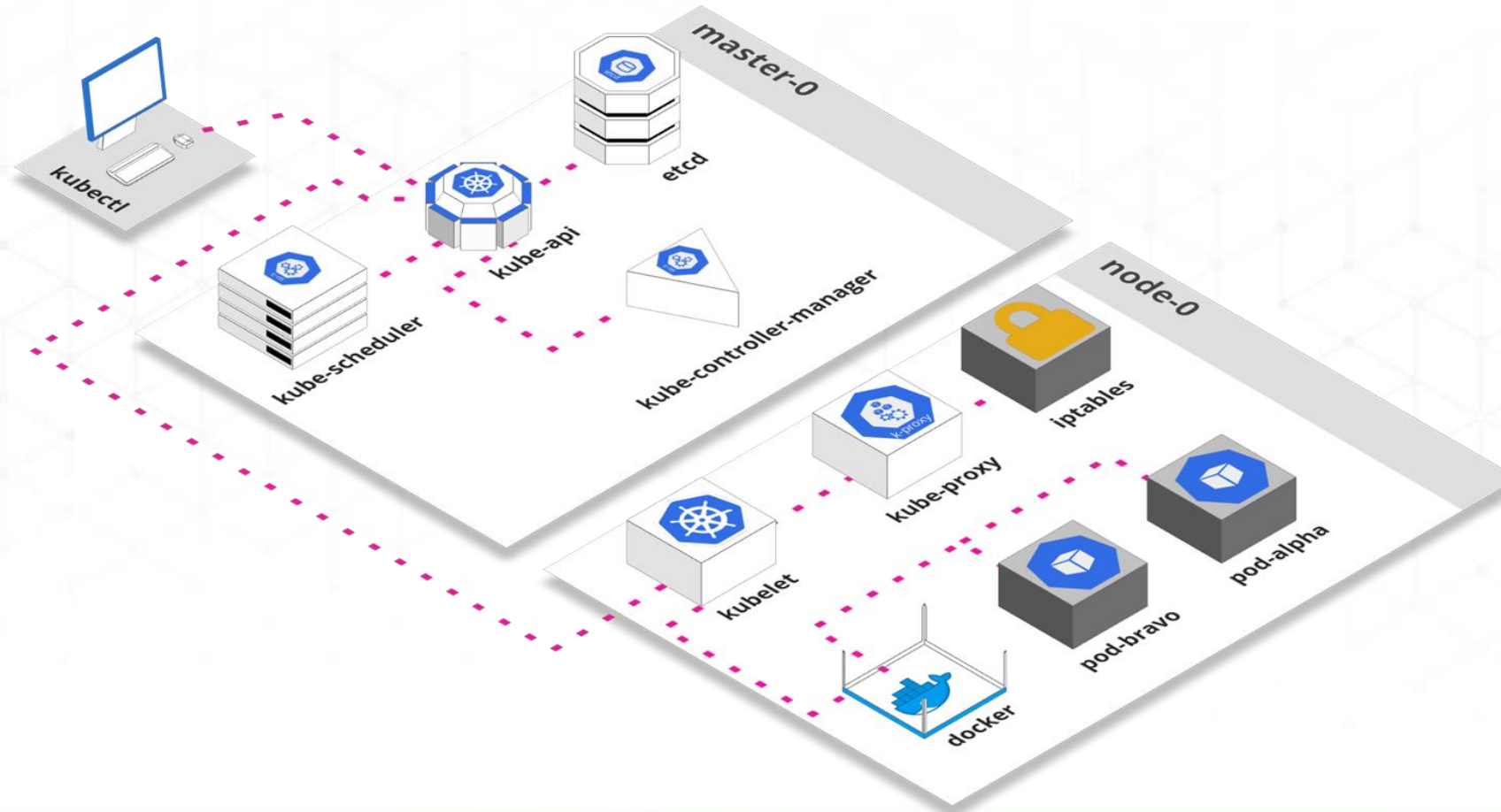
**Machine Learning**

**Batch Jobs**

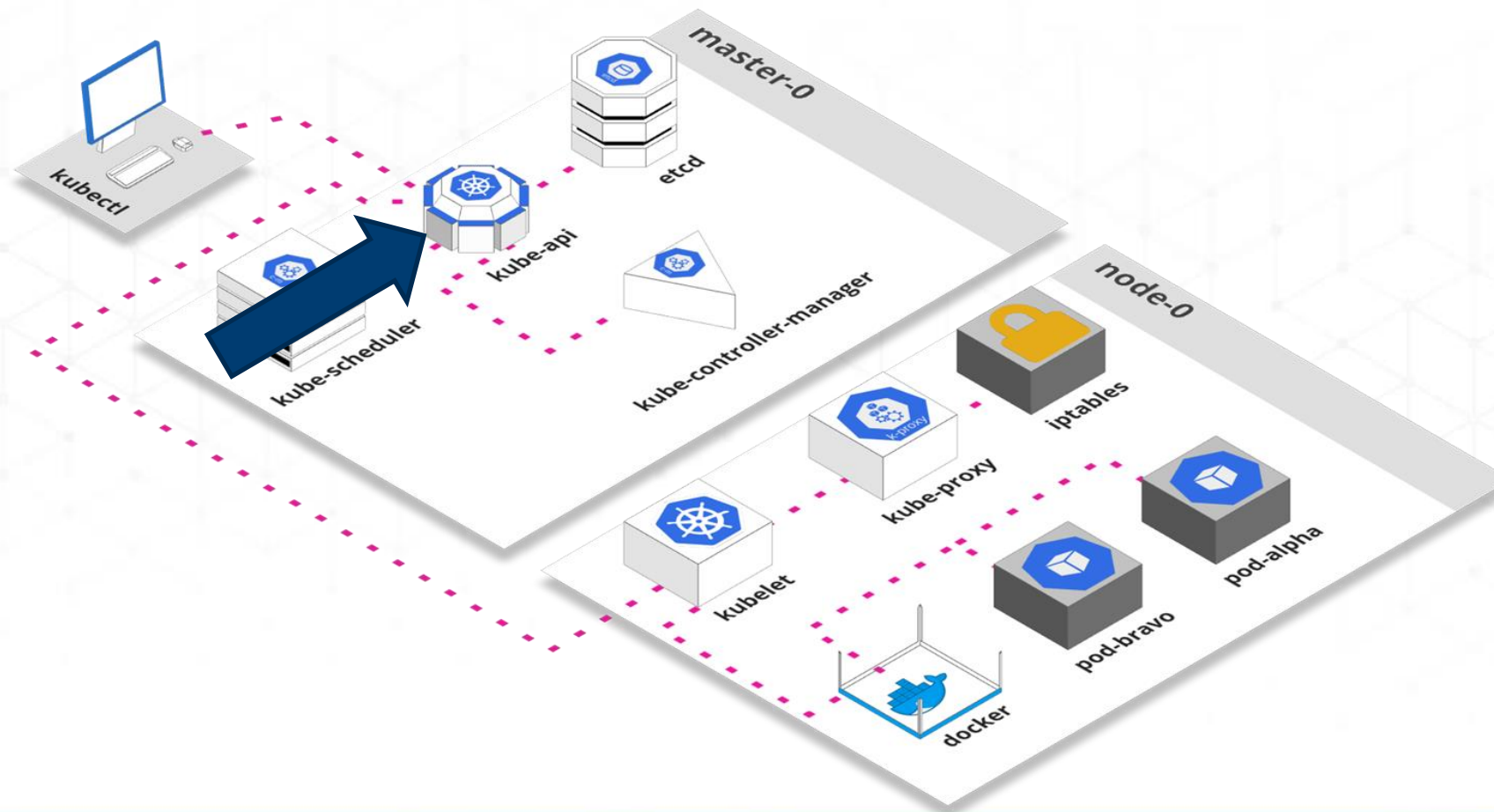
**Workflows**

**Enterprise  
Platforms**

# Kubernetes Architecture

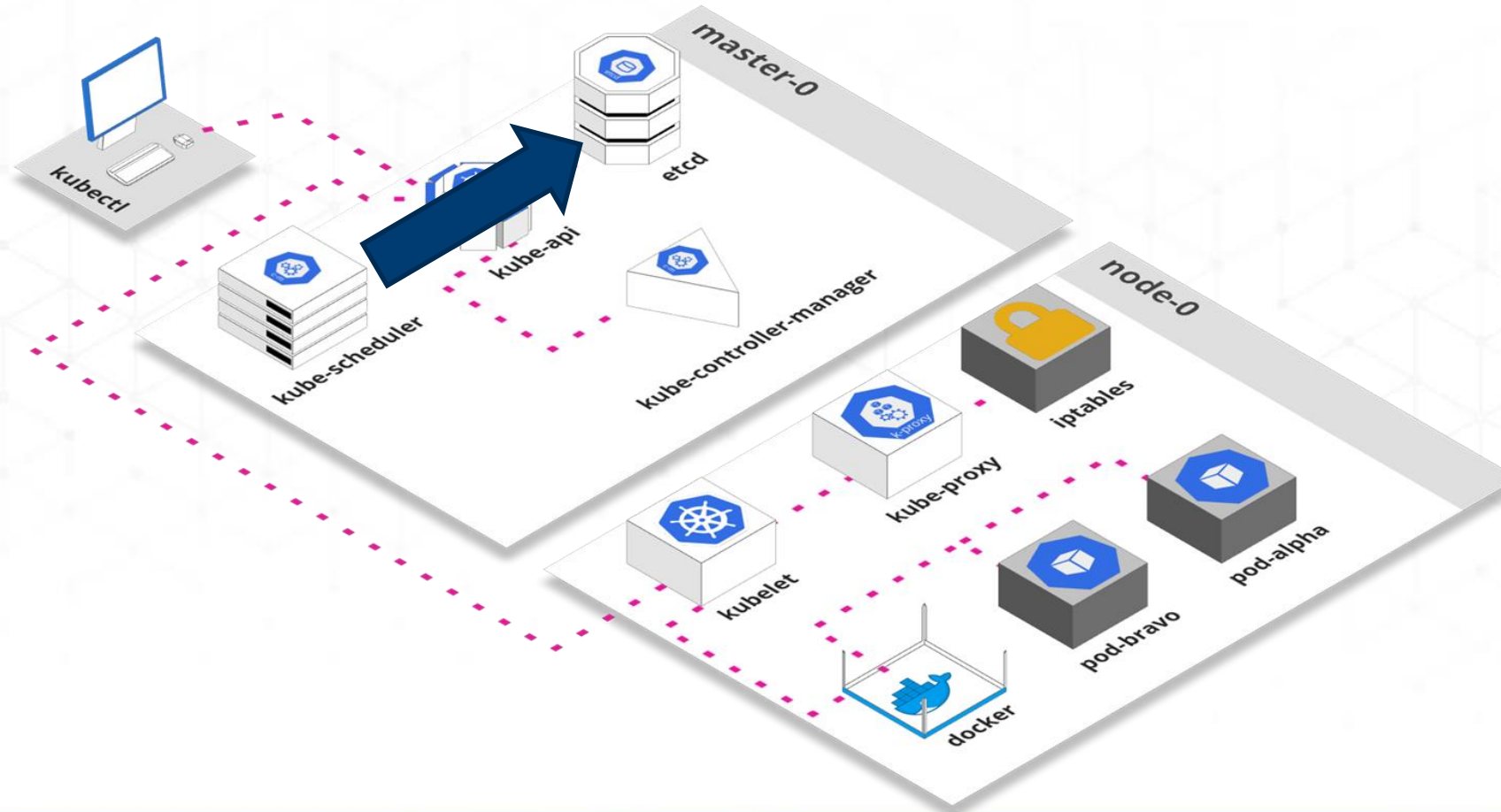


# Kubernetes Architecture

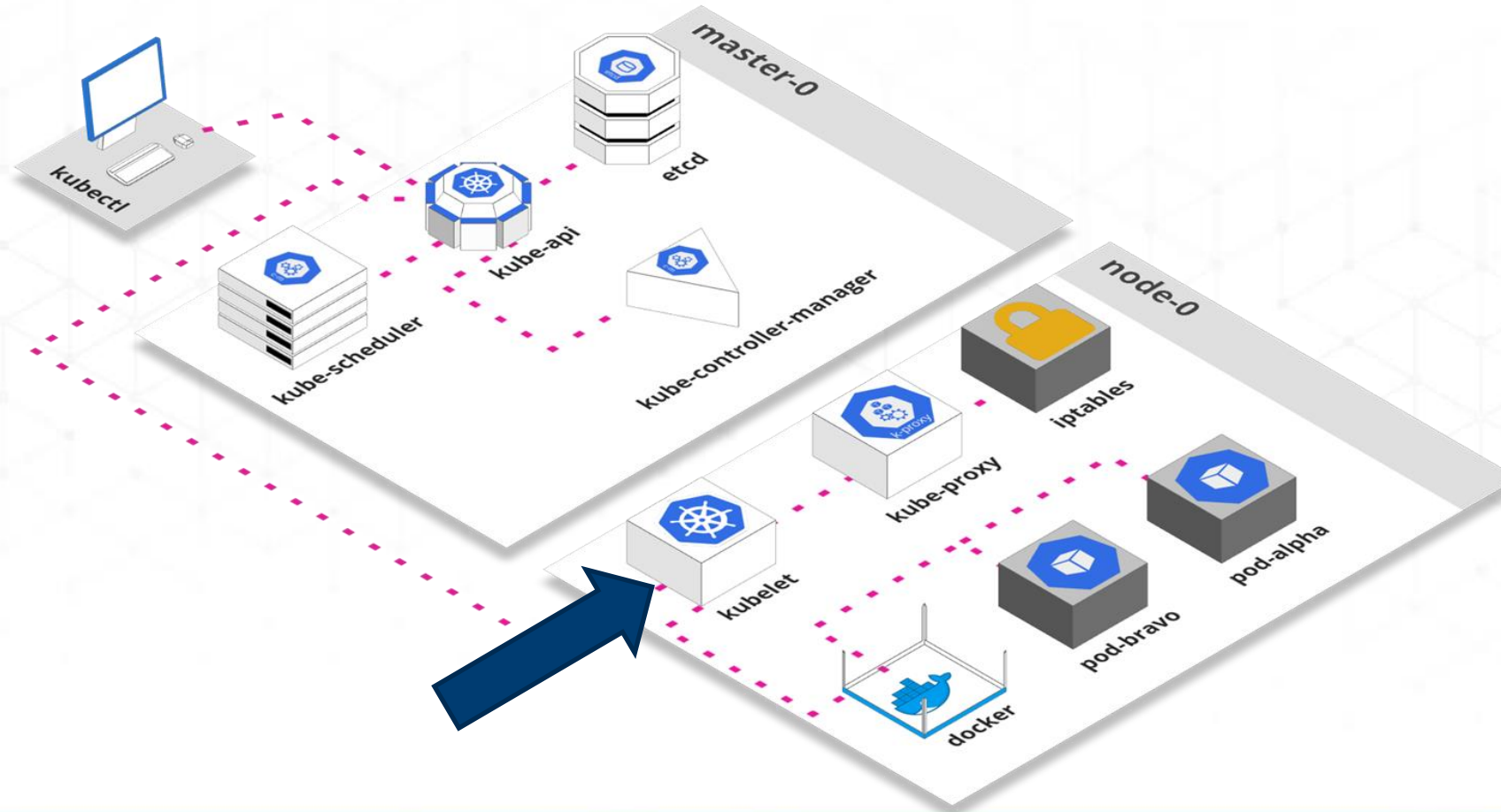




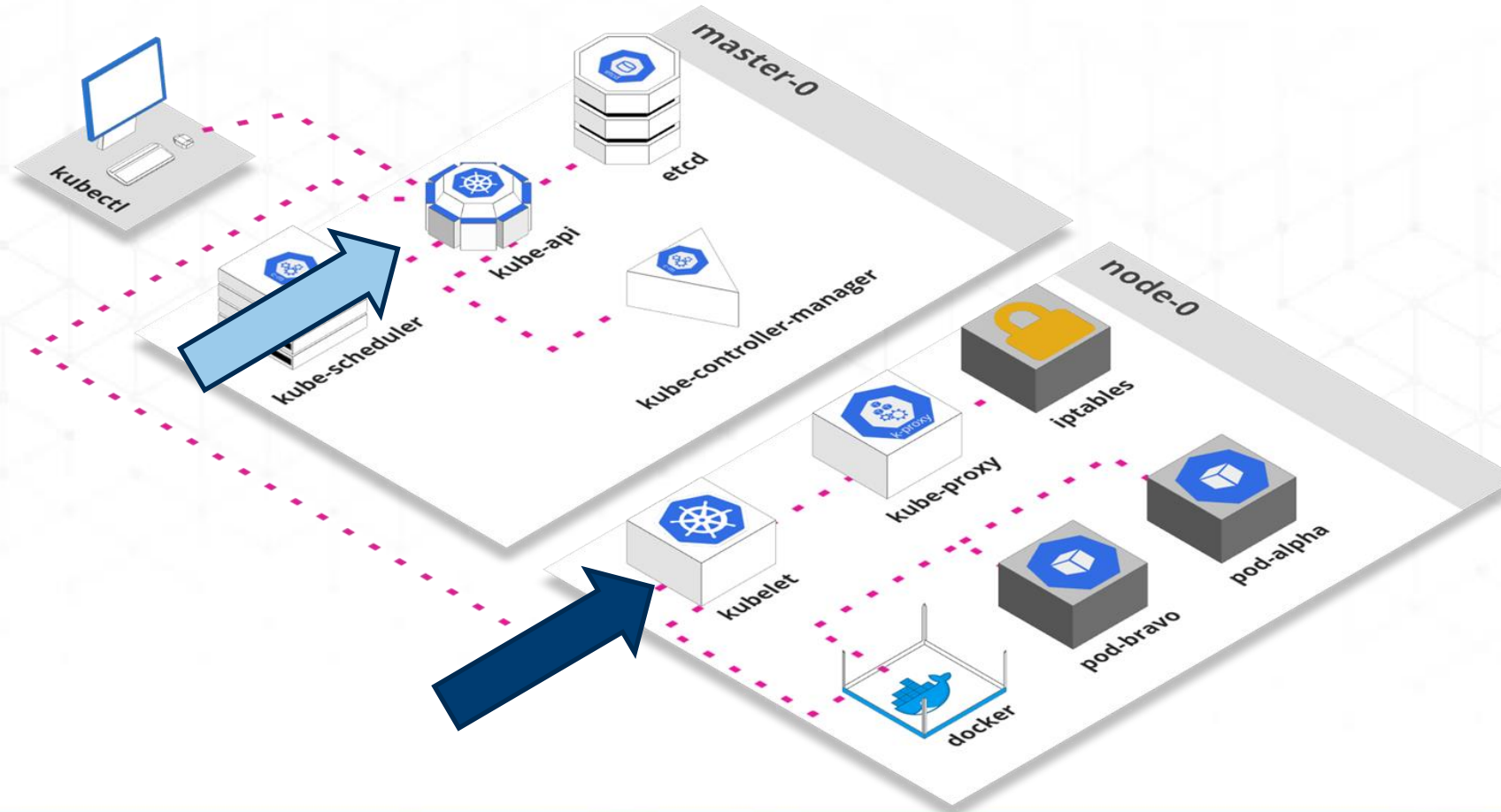
# Kubernetes Architecture



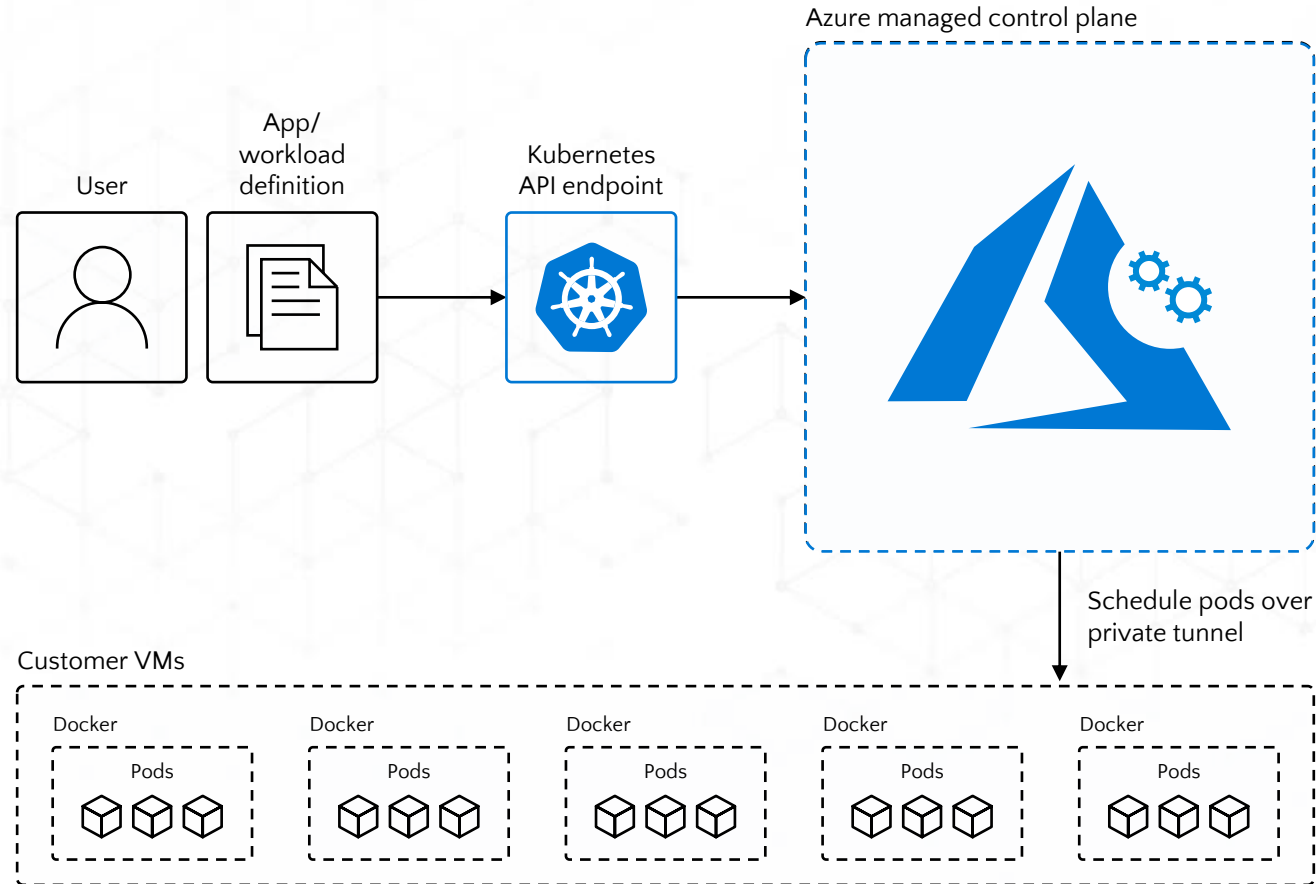
# Kubernetes Architecture



# Kubernetes Architecture

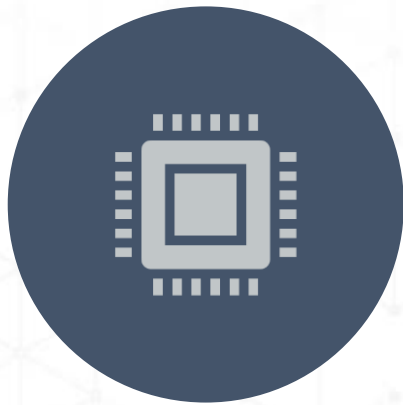


# Azure Kubernetes Service





# Azure Kubernetes Service



AUTOMATED PROVISIONING,  
UPGRADES, PATCHES



HIGH RELIABILITY,  
AVAILABILITY



EASY, SECURE, CLUSTER  
SCALING

# Azure Kubernetes Service



Rich integration with Azure services





















Support for Windows containers

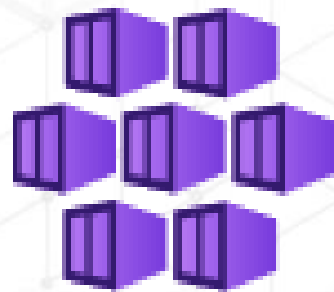


Master control plane at no charge

# Self-Hosted vs AKS

Responsibilities	DIY with Kubernetes	Managed Kubernetes on Azure
Containerization		
Application iteration, debugging		
CI/CD		
Cluster hosting		
Cluster upgrade		
Patching		
Scaling	 *	
Monitoring and logging		

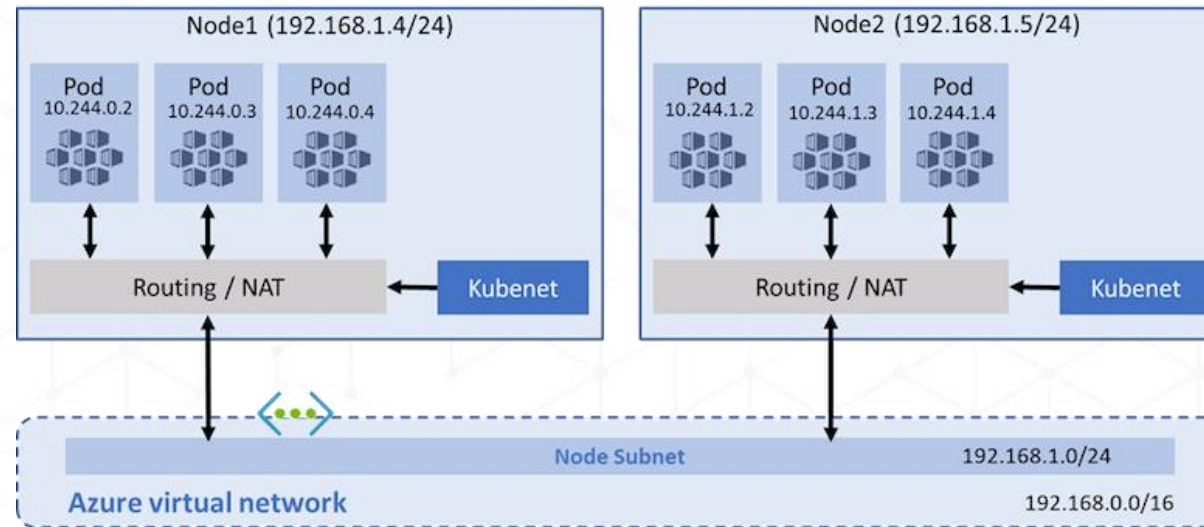
 Your Team    Microsoft



Demo

# The Big Decisions - Networking

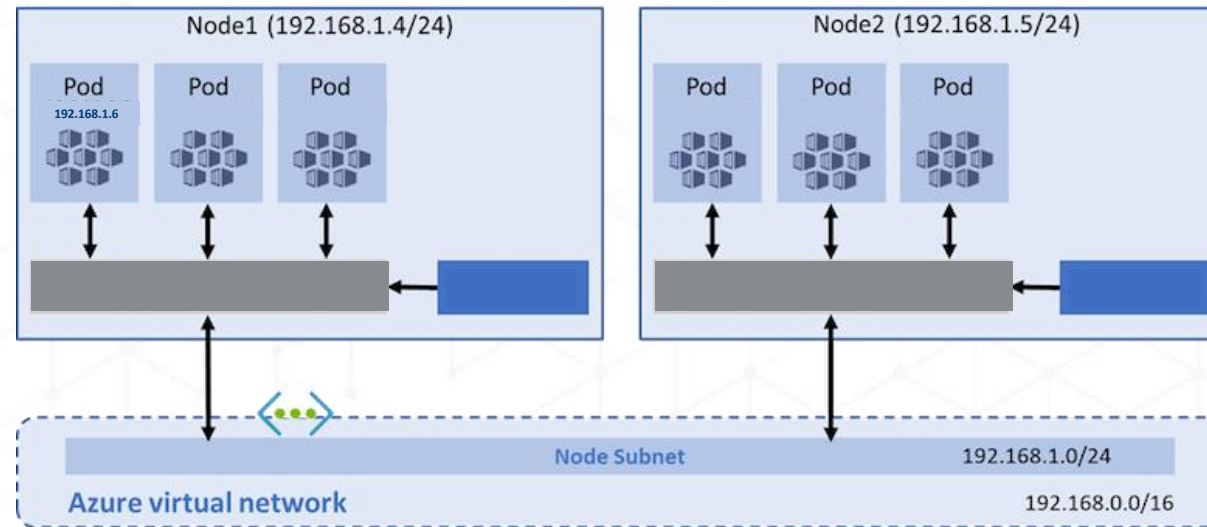
**Kubenet**  
(each node gets an IP)





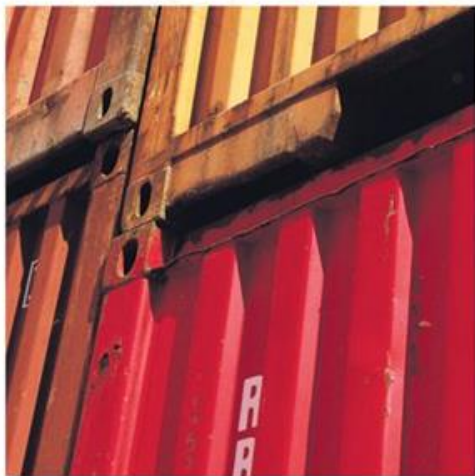
# The Big Decisions - Networking

**Azure CNI**  
(each pod gets an IP)



# The Big Decisions - People

- Which team will support it?
- What does support mean?
- Do each application team get their own cluster?
- Do we share DevOps people?
- What about Site Reliability Engineers (SREs)?
- Do we create a Kubernetes platform?
- Who's going to own the Kubernetes platform?



# Azure RedHat OpenShift (ARO)

By Nick

# What is OpenShift?

**RedHat OpenShift** is an enterprise-ready container orchestration platform.

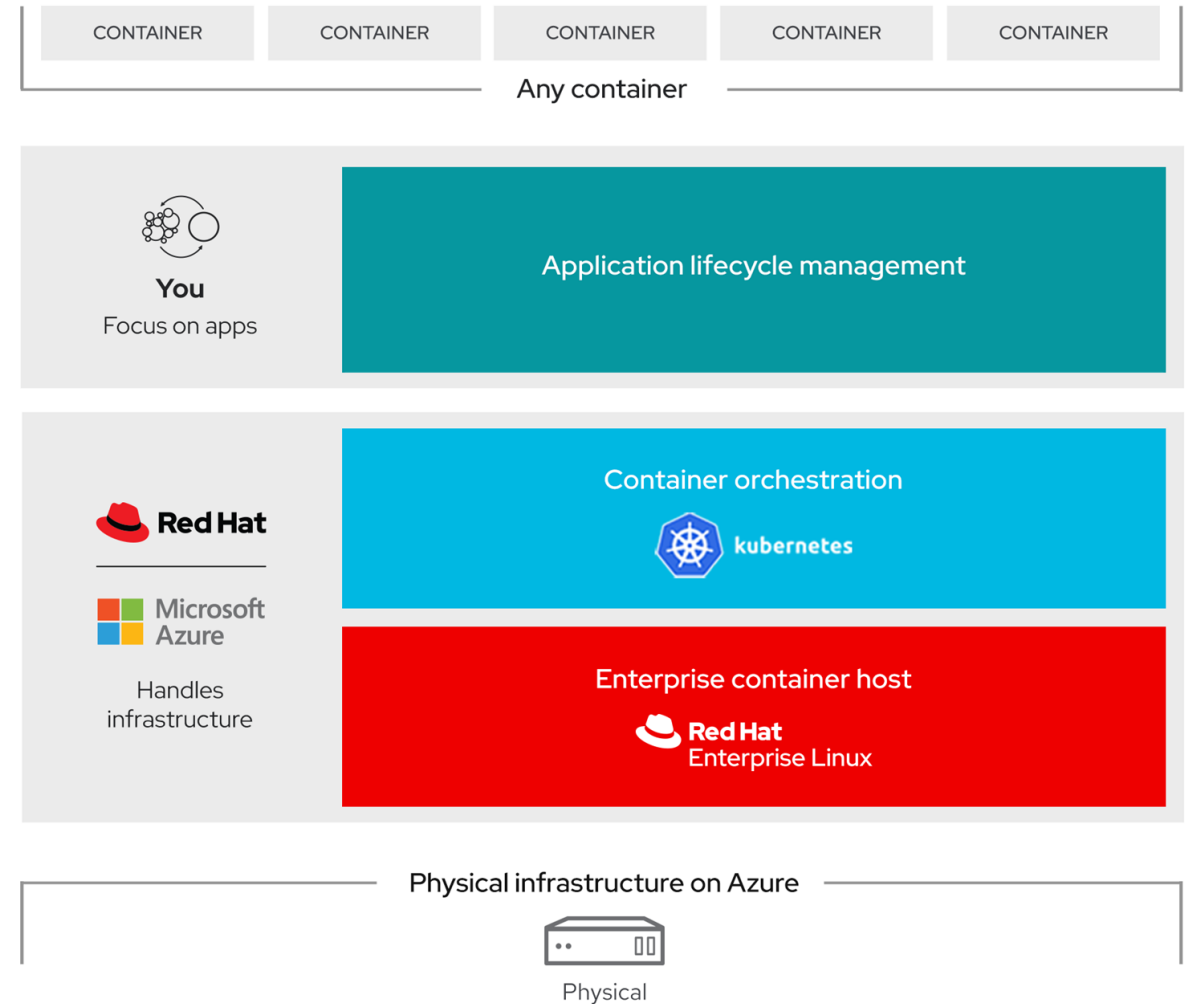
- Kubernetes++
- Enterprise Support
- Sane Defaults



# OPENSIFT

# What is Azure Red Hat OpenShift (ARO)?

- Enterprise Kubernetes
- Supported by Microsoft & Red Hat
- Fully-managed OpenShift
  - No virtual machines to operate
  - No patching required





# ARO Features and Benefits

## Cluster-admin role

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Full cluster administrator capabilities enabling running privileged containers and installing Custom Resource Definitions (CRDs).

## Integrated support experience

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Jointly engineered, operated, and supported by Red Hat and Microsoft with an integrated support experience and 99.95% uptime SLA.

## Operator Framework

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Available community and certified operators with developer self-service as well as Custom Resource Definitions (CRDs).

## Regulatory compliance

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Address comprehensive security and compliance needs with industry-specific standards and regulations such as PCI DSS, HITRUST, FedRAMP High, SOC 2, and more.

## Multi-Availability Zones clusters

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To ensure the highest resiliency, cluster components are deployed across 3 Azure Availability Zones in supported Azure regions.


## Global availability

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Available in 30+ regions supported by Microsoft Azure. Click [here](#) for the latest list of regions.

# Managed vs Self-Managed

























## SELF-MANAGED




	INFRASTRUCTURE	BILLED BY	MANAGED BY ⓘ	SUPPORTED BY ⓘ
 <b>Red Hat OpenShift</b>	<b>Any</b> Private cloud Public cloud Bare metal Virtual machines Edge	1. Red Hat for OpenShift  2. Any cloud or compute resources used from cloud provider(s)	Customer	Red Hat for OpenShift support  Another party for infrastructure support

## MANAGED


	INFRASTRUCTURE	BILLED BY	MANAGED BY ⓘ	SUPPORTED BY ⓘ
 <b>Red Hat</b>    Microsoft Azure  Microsoft Azure Red Hat OpenShift	<b>Cloud hosted</b> Azure	Microsoft	Red Hat and Microsoft	Red Hat and Microsoft

# DYI vs AKS vs ARO



Responsibilities	DIY with Kubernetes	Managed Kubernetes on Azure	Azure RedHat OpenShift
Containerization			
Application iteration, debugging			
CI/CD			
Cluster hosting			
Cluster upgrade			
Patching			
Scaling			
Monitoring and logging			


 Your Team    Microsoft    Microsoft & Red Hat

# Sneak Peek: Manage Your Clusters

 Red Hat Hybrid Cloud Console

All apps and services ▾



 Justin VanWinkle ▾

OpenShift

Clusters

Overview


Releases


Downloads


Insights


Subscriptions >

Cost Management >

Support Cases 

Cluster Manager Feedback 

Red Hat Marketplace 

Documentation 

Clusters > ARO Demo Cluster

ARO Demo Cluster

Open console Actions ↕

Overview Support

Details

Cluster ID

d757fc95-b710-49b2-adab-7b31fe637642

Type

ARO

Region

N/A

Provider

Azure

Version

OpenShift: 4.7.21

Life cycle state: Maintenance support


Created at

9/9/2021 9:50:25 AM

Owner

Justin VanWinkle

Status

 Ready

Total vCPU

36 vCPU

Total memory

141.15 GiB

Nodes

Control plane: 3

Worker: 3

Resource usage

vCPU

15.86%


of 36 Cores used

Memory

28.05%


of 141.15 GiB used


Cost breakdown



Track your OpenShift spending!

Add an OpenShift Container Platform cluster to see a total cost breakdown of your pods by cluster, node, project, or labels.

Add an OpenShift cluster to Cost Management 

3 

# Sneak Peek: Interact with the Cluster

- Kubectl
- OpenShift CLI
- Cluster Console

The screenshot displays the Red Hat OpenShift Cluster Console interface. The top navigation bar includes the Red Hat OpenShift logo, a menu icon, and user information (kube:admin). A blue banner at the top right states: "You are logged in as a temporary administrative user. Update the [cluster OAuth configuration](#) to allow others to log in."

The main content area is titled "Overview" and "Cluster". It is divided into several sections:

- Details:** Includes Cluster API address (<https://api.oks2zc.eastus.aroapp.io:6443>), Cluster ID (d757fc95-b710-49b2-adab-7b31fe637642), Provider (Azure), OpenShift version (4.7.21), and Update channel (Not available).
- Status:** Shows overall cluster status (Cluster, Control Plane, Operators) as green with a warning icon for Insights (2 issues found).
- Cluster utilization:** A table showing resource usage over time (3:45 PM to 4:30 PM).

Resource	Usage	Graph
CPU	30.64 available of 36	5
Memory	101.5 GiB available of 141.2 GiB	40 GiB / 20 GiB
Filesystem	3.27 TiB available of 3.37 TiB	100 GiB
Network transfer	3.12 MBps in / 5.67 MBps out	20 MBps
Pod count	173	200 / 100
- Cluster inventory:** Shows 6 Nodes, 279 Pods, 1 StorageClass, and 0 PVCs.
- Quick Starts:** Includes links for "Get started with Spring", "Monitor your sample application", and "Get started with Quarkus using a Helm Chart".
- Activity:** Shows ongoing activities and recent events. Recent events include: 4:41 PM Stopping container regist..., 4:41 PM Successfully pulled image..., 4:41 PM Created container registr..., 4:41 PM Started container registry..., 4:41 PM Pulling image "registry.re...", 4:41 PM Add eth0 [10.129.2.237/23], 4:41 PM Successfully assigned op..., and 4:38 PM Stopping container regist...



# Sneak Peek: Deploy an Application

- `oc apply -f nginx.yaml`
- `kubectl apply -f nginx.yaml`
- Cluster Console

The screenshot shows the Red Hat OpenShift Cluster Console interface. On the left is a sidebar with navigation links: Administrator, Home, Operators, Workloads (expanded), Pods, Deployments (selected), DeploymentConfigs, StatefulSets, Secrets, ConfigMaps, CronJobs, Jobs, DaemonSets, ReplicaSets, ReplicationControllers, HorizontalPodAutoscalers, Networking, Storage, and Builds. The main panel is titled 'Create Deployment' and includes a sub-header 'Create by manually entering YAML or JSON definitions, or by dragging and dropping a file into the editor.' Below this is a text editor with a dark theme containing the following YAML code:

```
1 apiVersion: apps/v1
2 kind: Deployment
3 metadata:
4   name: example
5   annotations:
6     image.openshift.io/triggers: |-
7       {
8         "from": {
9           "kind": "ImageStreamTag",
10          "name": "openshift/hello-openshift:latest"
11        },
12        "fieldPath": "spec.template.spec.containers[0].image"
13      }
14 namespace: default
15 spec:
16   selector:
17     matchLabels:
18       app: hello-openshift
19   replicas: 3
20   template:
21     metadata:
22       labels:
23         app: hello-openshift
24     spec:
25       containers:
26       - name: hello-openshift
27         image: openshift/hello-openshift
28         ports:
29         - containerPort: 8080
```

At the bottom of the editor are 'Create' and 'Cancel' buttons, and a 'Download' button with a download icon. On the right side of the console, there is a 'Deployment' panel with a 'Schema' tab. The 'Schema' tab contains the following information:

**Deployment**

Deployment enables declarative updates for Pods and ReplicaSets.

- **apiVersion** string  
APIVersion defines the versioned schema of this representation of an object. Servers should convert recognized schemas to the latest internal value, and may reject unrecognized values. More info: <https://git.k8s.io/community/contributors/devel/sig-architecture/api-conventions.md#resources>
- **kind** string  
Kind is a string value representing the REST resource this object represents. Servers may infer this from the endpoint the client submits requests to. Cannot be updated. In CamelCase. More info: <https://git.k8s.io/community/contributors/devel/sig-architecture/api-conventions.md#types-kinds>
- **metadata** object  
Standard object metadata.  
[View details](#)
- **spec** object  
Specification of the desired behavior of the Deployment.

# Bonus: Deploy Tools with Ease

The screenshot displays the Red Hat OpenShift OperatorHub interface. On the left, a sidebar contains navigation links: Administrator, Home, Operators (selected), Installed Operators, Workloads, Pods, Deployments, DeploymentConfigs, StatefulSets, Secrets, ConfigMaps, CronJobs, Jobs, DaemonSets, ReplicaSets, ReplicationControllers, HorizontalPodAutoscalers, and Networking. The main area shows a list of operators with filters for Project, Capability level, and Infrastructure features. The Grafana Operator is highlighted, showing its details in a modal window.

**Red Hat OpenShift**

You are logged in as a temporary a

Project: All Projects

- ☐ Red Hat (11)
- ☐ APIMatic.io (0)
- ☐ Alcide (0)
- ☐ Alvearie (0)
- ☐ Anaconda (0)
- Show 192 more

Capability level

- ☐ Basic Install (41)
- ☐ Seamless Upgrades (10)
- ☐ Full Lifecycle (5)
- ☐ Deep Insights (10)
- ☐ Auto Pilot (0)

Infrastructure features

- ☐ Disconnected (7)
- ☐ Proxy-aware (1)
- ☐ FIPS Mode (1)

**Grafana Operator**

3.10.3 provided by Red Hat

[Install](#)

**Latest version**

3.10.3

**Capability level**

- ☒ Basic Install
- ☐ Seamless Upgrades
- ☐ Full Lifecycle
- ☐ Deep Insights
- ☐ Auto Pilot

**Provider type**

Community

**Provider**

Red Hat

**Repository**

<https://github.com/integr8ly/grafana-operator>

**Container image**

quay.io/grafana-operator/grafana-operator:v3.10.3

**Created at**

Jul 31, 2020, 12:00 AM

**Support**

Red Hat

**Community Operator**

This is a community provided Operator. These are Operators which have not been vetted or verified by Red Hat. Community Operators should be used with caution because their stability is unknown. Red Hat provides no support for community Operators.

[Learn more about Red Hat's third party software support policy](#)

A Kubernetes Operator based on the Operator SDK for creating and managing Grafana instances.

Grafana is an open platform for beautiful analytics and monitoring. For more information please visit the [Grafana website](#)

**Current status**

The Operator can deploy and manage a Grafana instance on Kubernetes and OpenShift. The following features are supported:

- Install Grafana to a namespace
- Configure Grafana through the custom resource
- Import Grafana dashboards from the same or other namespaces
- Import Grafana data sources from the same namespace
- Install Plugins (panels)



**OPENSIFT**

**Demo**

**Do it yourself**



# Companion Website

## Cloud-Native Workshop: Know your options for Kubernetes on Azure

by BoxBoat, an IBM Company

Slides

GitHub

<https://boxboat.github.io/k8s-on-azure-wkshp-slg/>

### 0. Pre-Requisites

Let's get you set-up

READ MORE →

### 1. Lab - Intro to Azure Kubernetes Service (AKS)

Let's get started with AKS!

READ MORE →

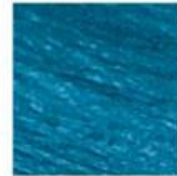
### 2. Lab - Intro to Azure RedHat OpenShift (ARO)

Let's get started with ARO!

READ MORE →



# Wrapping Up



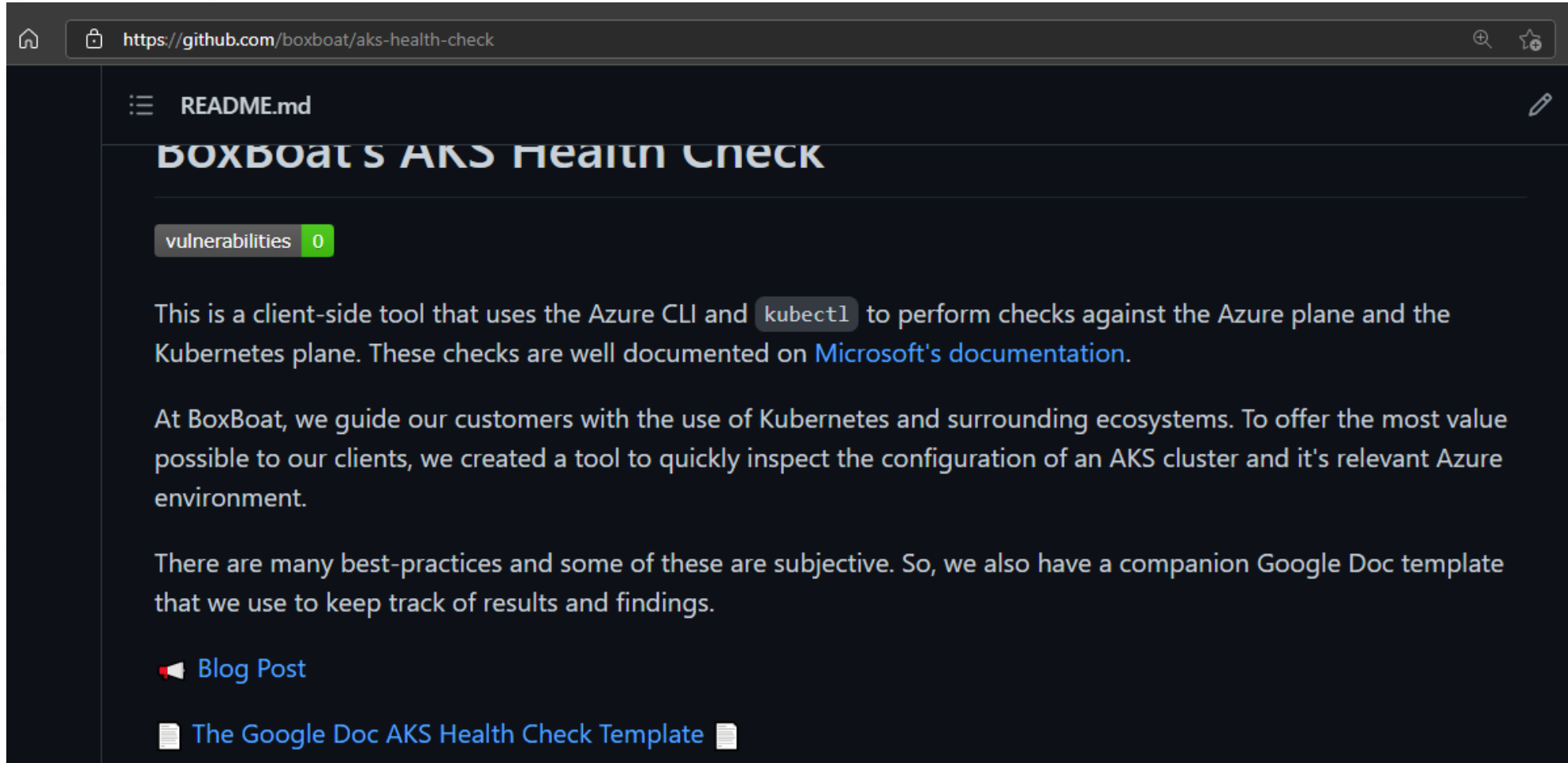
# Summary

- Kubernetes is here to **stay**
- A lot of **control over your infrastructure** and a lot of **agility**
- You might not need Kubernetes; you might be able to use Platform as a Service
- **Azure Kubernetes Service** is a managed Kubernetes offering
  - You still must:
    - Learn containerization & Kubernetes
    - Make choices on more tooling (Azure vs Open-Source vs Third Party)
    - Figure out how to support it
    - Figure out how to support issues on Kubernetes

# Summary

- **Azure RedHat OpenShift** is an opinionated and managed Kubernetes offering jointly supported with RedHat.
  - **Less pressure** to:
    - Learn containerization & Kubernetes
    - Make choices on more tooling
    - Figure out how to support it
  - You can leverage RedHat support for issues with Kubernetes

# AKS Health Check



The screenshot shows the GitHub repository page for `boxboat/aks-health-check`. The page title is `README.md`. The main heading is **BOXBOAT'S AKS Health Check**. Below the heading, there is a badge indicating `vulnerabilities 0`. The text describes the tool as a client-side utility using Azure CLI and `kubectl` to verify AKS cluster configurations. It mentions that the checks are documented on Microsoft's site. The text also states that BoxBoat guides customers with Kubernetes and its ecosystem, and created this tool to inspect AKS cluster configurations. It further mentions that there are many best-practices and some are subjective, so they also have a companion Google Doc template to track results and findings. At the bottom, there are two links: [Blog Post](#) (with a megaphone icon) and [The Google Doc AKS Health Check Template](#) (with a document icon).

https://github.com/boxboat/aks-health-check

README.md


## BOXBOAT'S AKS Health Check


vulnerabilities 0

This is a client-side tool that uses the Azure CLI and `kubectl` to perform checks against the Azure plane and the Kubernetes plane. These checks are well documented on [Microsoft's documentation](#).

At BoxBoat, we guide our customers with the use of Kubernetes and surrounding ecosystems. To offer the most value possible to our clients, we created a tool to quickly inspect the configuration of an AKS cluster and it's relevant Azure environment.

There are many best-practices and some of these are subjective. So, we also have a companion Google Doc template that we use to keep track of results and findings.

 [Blog Post](#)

 [The Google Doc AKS Health Check Template](#) 

# AKS Health Check

- If you're tried AKS...
- Value-packed assessment where we assess your environment and ensure its following Microsoft's best practices
  - **Time Commitment:** Up to 2 hrs.
  - **We don't need access**





Questions?