



**boxboat**  
technologies

# Azure Cloud-Native Workshop

Containerize and deploy applications to Azure Kubernetes Service (AKS)



# Who Am I?

Faheem Memon

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Sr. Solutions Architect @ BoxBoat Technologies

- Helping customers with cloud-native technologies
- Azure Practice Area Lead at BoxBoat
- Over 15 years of app dev experience



# Who Am I?

**Facundo Guana**

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

Solutions Architect @ BoxBoat Technologies

- Helping orgs use Kubernetes on Azure



# Before we begin

- We expect everyone to be at different levels.  
**All questions are welcomed.**
- **Ask questions in the chat** at any time.
- We will have live Q/A sessions.
- Don't stress to absorb everything.
- The material will be available to you after the workshop



# About BoxBoat Technologies

**BoxBoat** was founded to help innovative organizations achieve DevOps Transformation through the adoption of **Cloud Native** technologies. We are engineers at heart and enjoy solving challenging problems by utilizing cutting-edge solutions through **Kubernetes** and **Automation**.

- Cloud Native Application Modernization
- DevSecOps Services & Assessments
- Training (Docker, K8s)
- Managed Services
- Strategic Roadmapping / Maturity Model
- Professional Services focus
- HashiCorp Partner
- Microsoft Gold Partner
- Microsoft Cloud Native Accelerate Program

Deliver software faster with BoxBoat, a CNCF authorized Kubernetes Services Provider.



# At a Glance

## Company

- Founded on **DevSecOps** principals in 2016
- Accelerate growth of DevSecOps through **Kubernetes and Automation**
- 60+ years of Senior Leadership experience
- 90 / 10 Commercial / Federal

## National Presence

- Atlanta
- Boston
- Dallas
- Huntsville
- NYC
- Phoenix
- Raleigh
- San Francisco
- Tampa
- Washington, D.C.

25+  
full stack engineers

99%  
client satisfaction

200+  
commercial and  
federal clients

2,500+  
training hours  
delivered

150+  
Open-source  
contributions

1500+  
managed clusters

# Satisfied Customers

"BoxBoat's knowledge and willingness to teach our staff has been extremely helpful as we build our teams and their skills. Your flexibility and customer focus has been incredible... we greatly appreciate BoxBoat at Melco!"

- Andrew Tracy, Melco Resorts

"In all my years...Jesse was the most knowledgeable, helpful, and most professional I have ever worked with."

- Nouha Khalil, Wiley Education

"Brandon has been incredible for us. He has an expert skillset and is a great team member."

- Trevor Sterritt, Paychex

"I am completely impressed with the work BoxBoat has done and in particular with the people on the team. I have worked with many contractors and vendors in the past; BoxBoat has been the best ever."

- Matt Eberle, NETSCOUT

# MARS



# WILEY

# PAYCHEX



# NETSCOUT



# Boar's Head



The Motley Fool

# pwc

# TVA



# HARVARD UNIVERSITY



# JOHN DEERE

# Hertz



# FLY

# STAMPIN' UP!

INSPIRE • CREATE • SHARE



We maintain Subject Matter Expertise in  
**Cloud Native DevSecOps**. As CNCF  
Partners, this is our core foundation, and  
not the full extent of our capabilities

#### Kubernetes

- Azure Kubernetes Service (AKS)
- Rancher (RKE)
- VMware Tanzu (PKS)
- Other managed K8s platforms

#### Automation

- HashiCorp Terraform
- Ansible / AWX
- Chef / Puppet
- Azure Resource Manager

#### CI / CD

- Jenkins
- Bamboo
- GitHub / Azure DevOps
- GitLab

#### Security

- Hashicorp Vault
- Traefik/Envoy/Istio
- Harbor
- Zero Trust / SPIFFE SPIRE

#### Logging / Monitoring

- ELK / EFK / Enterprise
- Splunk
- Prometheus
- New Relic

#### Development

- Golang
- Node.js
- Java
- C#, .NET, .NET Core, C++

# Core Skills

BoxBoat provides best in class engineering, training, and support services for **DevSecOps** methodologies, tools, and integrations whether on-premise, cloud, or hybrid.

- We explicitly hire engineers with **Full Stack** operational experience in both professional software development and DevSecOps administration
- Our team culture emphasizes the ability to “figure it out,” providing a proper solution no matter the technology or challenges
- We are open-source contributors, circuit speakers, **Certified Kubernetes Administrators**, and automation evangelists

# Agenda

10:00 - 10:15 am	<b>Container Awesomeness</b>
10:15 - 10:30 am	<b>Intro to Containers</b>
10:30 - 10:50 am	<b>(Demo/Lab) Building Containers</b>
10:50 - 11:00 am	<b>Q / A</b>
11:00 - 11:20 am	<b>Intro to Kubernetes and Azure Kubernetes Service</b>
11:20 - 11:50 am	<b>(Demo/Lab) AKS / Kubernetes</b>
11:50 - 12:00 pm	<b>Q / A</b>



# Follow Along

- An Azure subscription with at least “Contributor” rights
- Azure Kubernetes Cluster
- A workstation with:
  - Docker Desktop
  - Azure CLI
  - Code Editor

<https://boxboat.github.io/aks-wkshp-1/>



# Container Awesomeness

Live Demo



# Intro to Containers

Docker Fundamentals



# **Why are we Talking About Containers?**

"A survey of 750 hiring managers by the Linux Foundation and DICE reported that **57 percent** are seeking employees with container skills, up from 27 percent in last year's survey"

<https://thenewstack.io/steady-docker-adoption-leads-to-jump-in-hiring/>

## Benefits of Containers

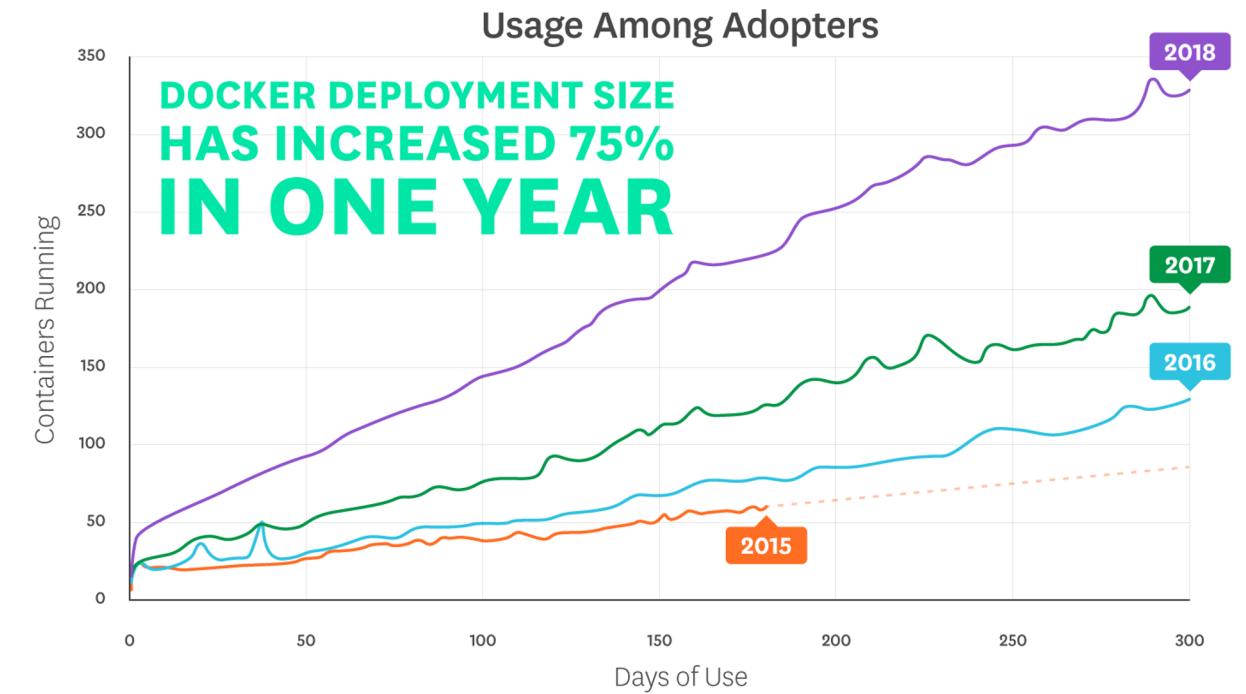
### Development

- Speed up development inner loop
- Solves "*the code worked on my system*" problem
- Test entire systems locally
- Minimal disruption to developer process

# Benefits of Containers

## IT / Operations

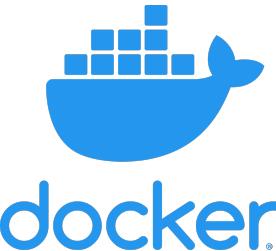
- Improved application density
- Reduced CPU, RAM, disk usage
- Containers are ephemeral
- Faster (and automatic) recovery
- Enhanced security
- Natural integration to CI/CD
- Less hardware / easier provisioning



# Container Technology has Matured

## Current Platforms

- Ubuntu
- Windows
- RedHat
- Mainframe
- Cloud
- IoT
- And more



# Virtual Machines vs Containers

## Virtual Machines

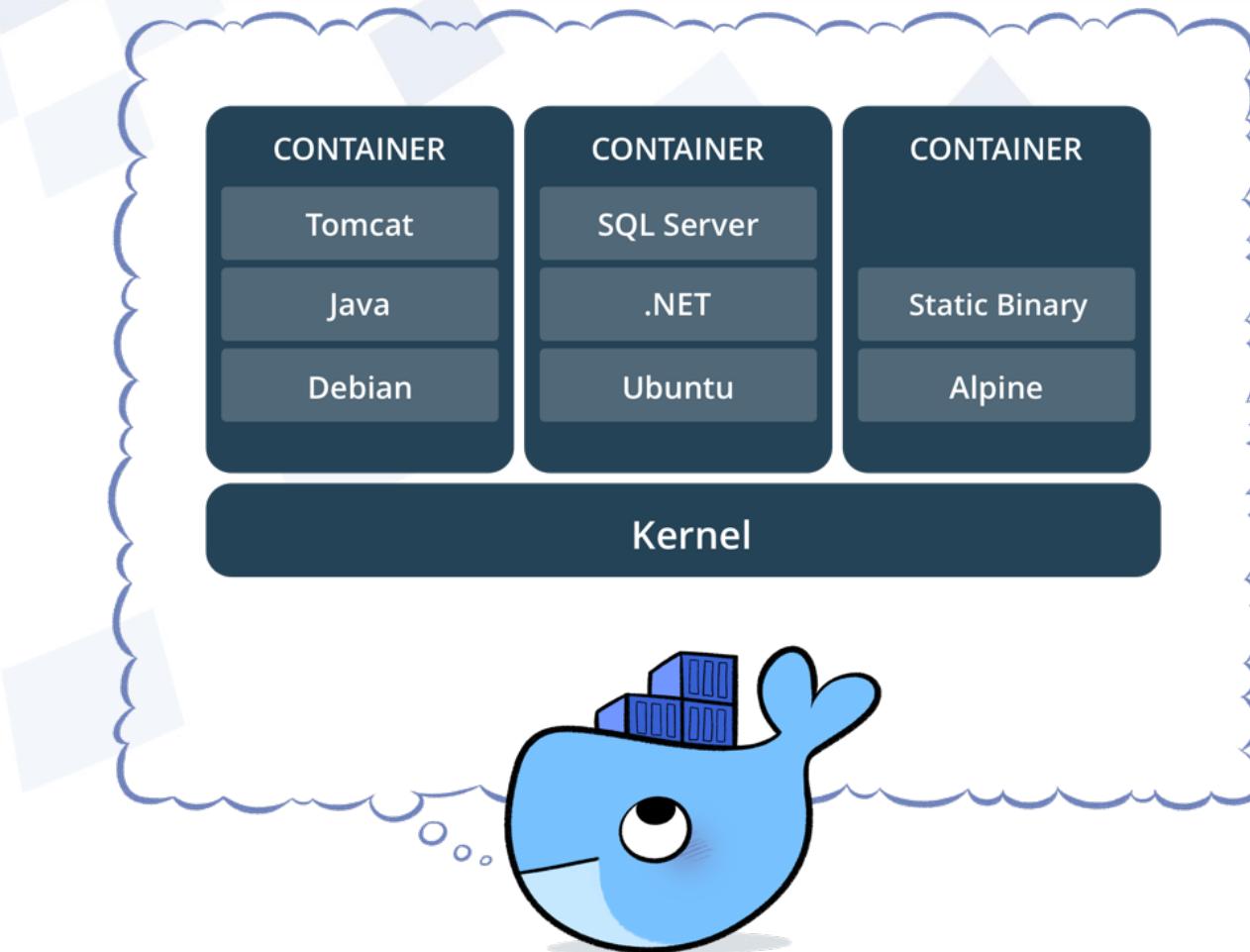
- Abstraction of physical hardware turning one server into many servers
- Provides workload isolation
- Hypervisor allows multiple VMs to run on a single machine
- Full-blown OS and runtime libraries. Footprint typically in GBs
- Takes minutes to boot

## Containers

- Abstraction of application and configuration packaged together
- Provides workload isolation
- Runs on a shared OS kernel using OS primitives for isolation.
- Smaller footprint, typically in MBs
- Takes seconds to boot



# Diverse Container Deployments



# Key Container Benefits

## Operations

- Low overhead compared to traditional deployment strategies
- On-premise and cloud supported
- Minimizes IT overhead
  - Easier to provision infrastructure
  - Faster disaster recovery
- Runs on bare-metal or VMs
- Enhanced security
- Customizable networking
- Built-in high availability

## Development and Testing

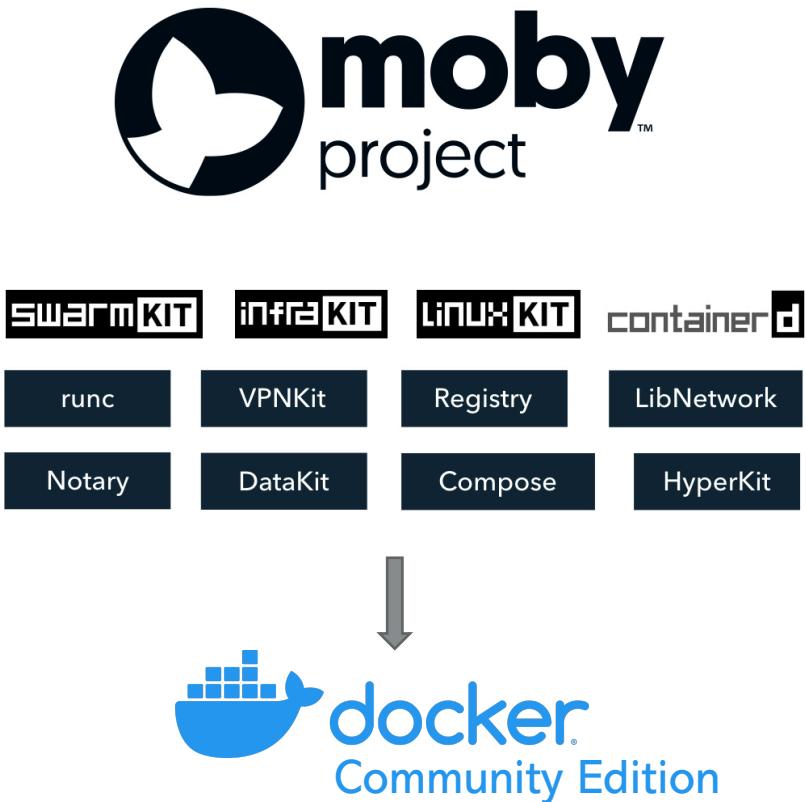
- Efficient development inner loop
- Standardize development environments
- Standardize application packaging technology
- Natural integration with CI/CD
- Quickly standup a new test environment



# Docker Overview

# What is Docker?

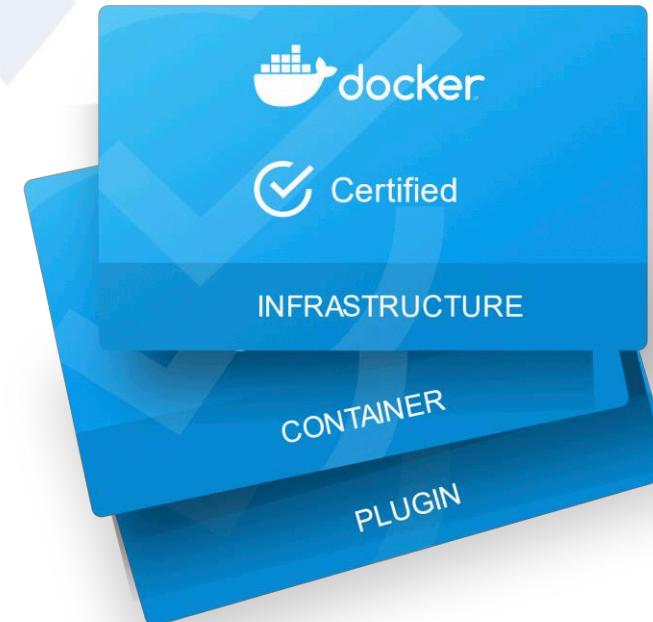
Docker is a set of software packages that enables OS-based virtualization to build, deploy, scale, and manage containers.



# Docker Hub

- Docker Hub provides a way to share container applications.
- Hosts both public and private repositories
- Over 100,000 container images from software vendors, open-source projects, and the community.

<https://hub.docker.com>



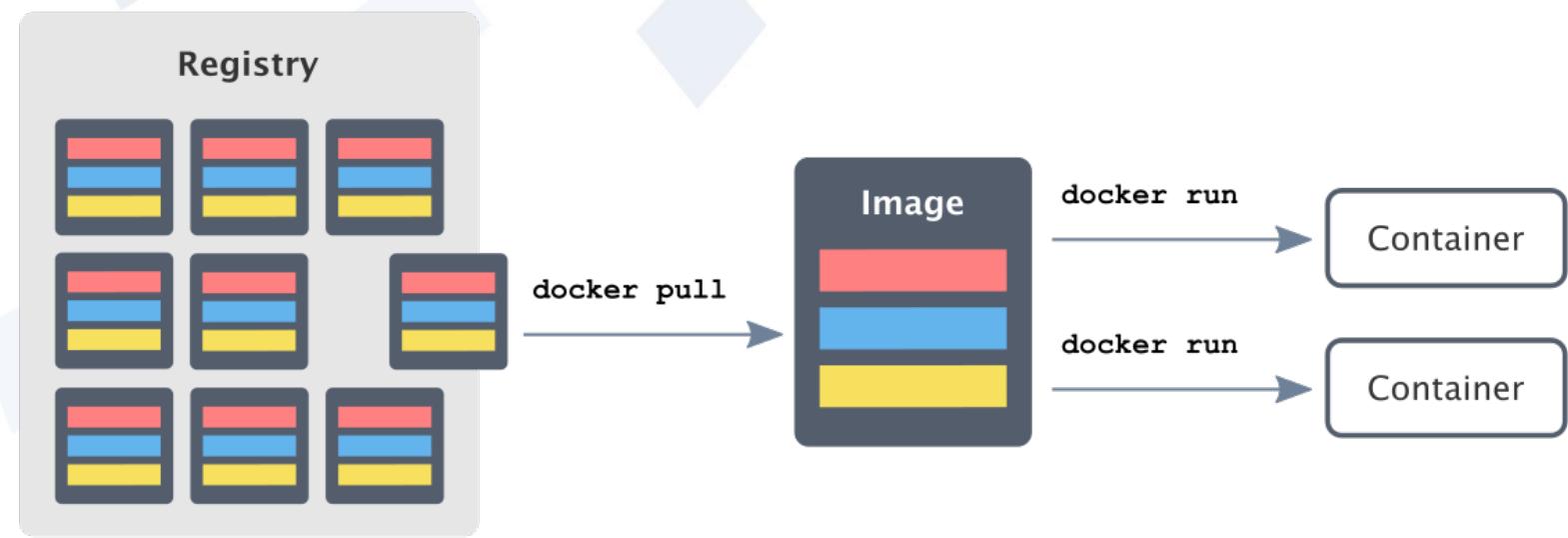
# Docker Desktop

- Docker Engine
- Docker CLI
- GUI Dashboard
- Kubernetes Cluster



# Running Containers

- docker version
- docker run -it alpine
- docker ps
- docker image ls
- docker exec
- docker logs

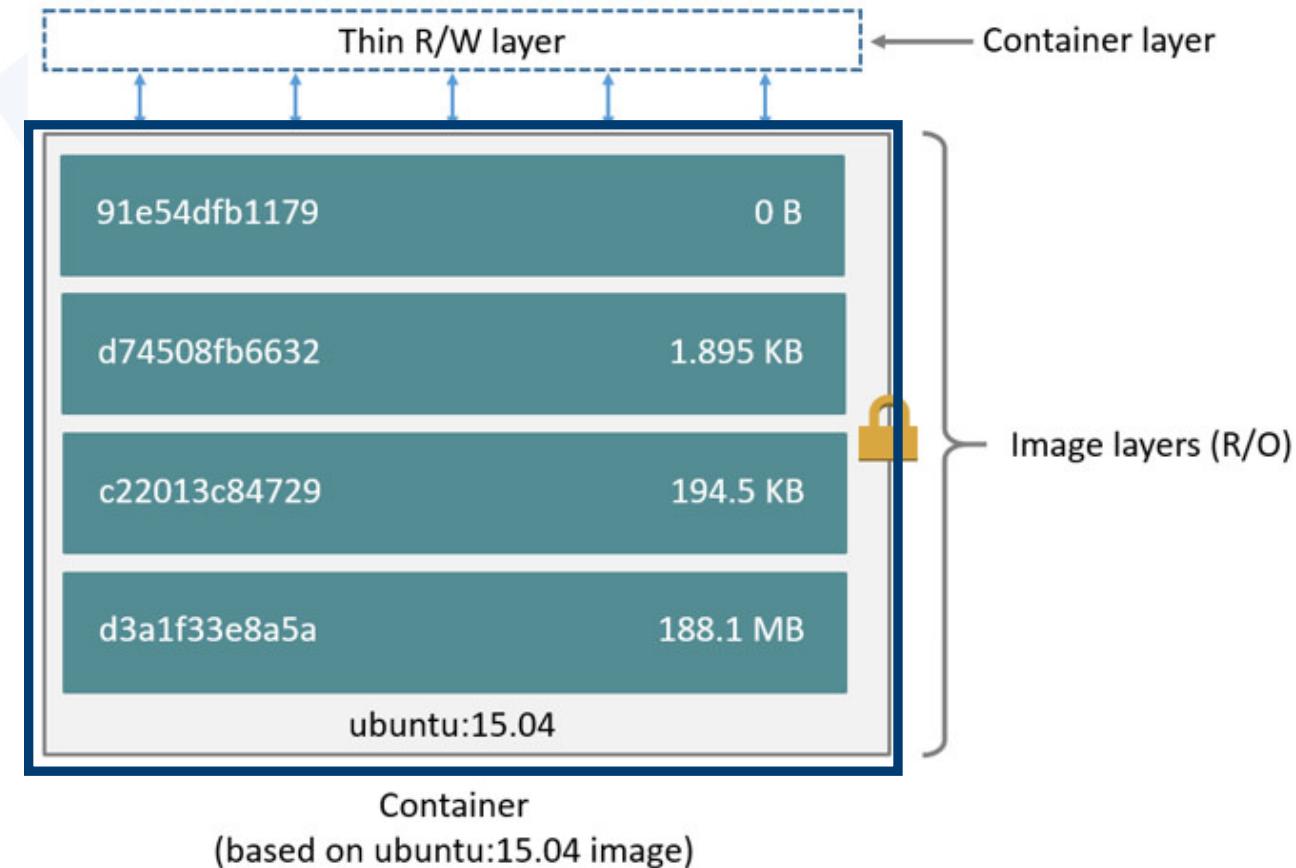


<https://docs.docker.com/engine/reference/commandline/cli/>



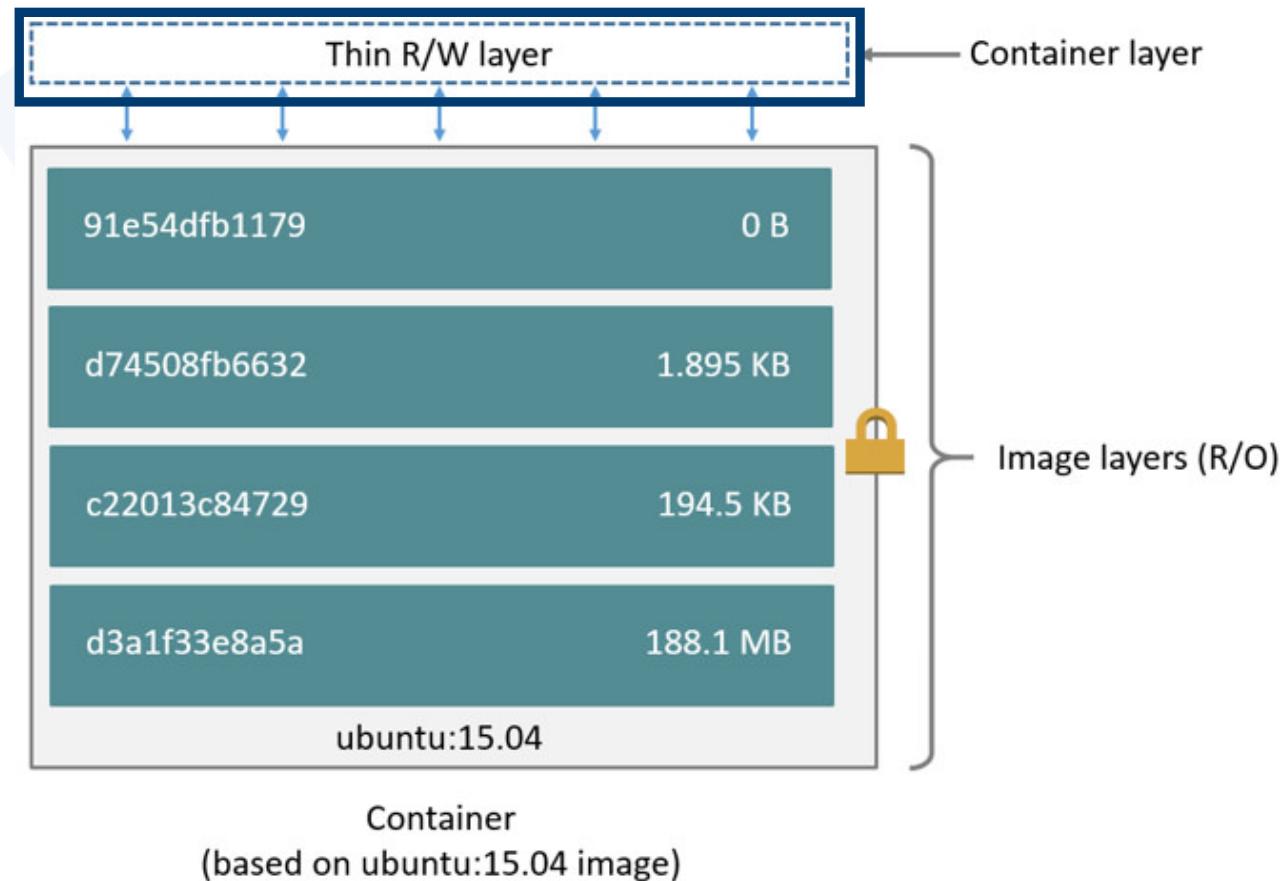
# What is a Container Image?

- Layered **read-only** filesystem
- Contains application code and dependencies
- Stores application configuration and secrets
- Defines how an application starts



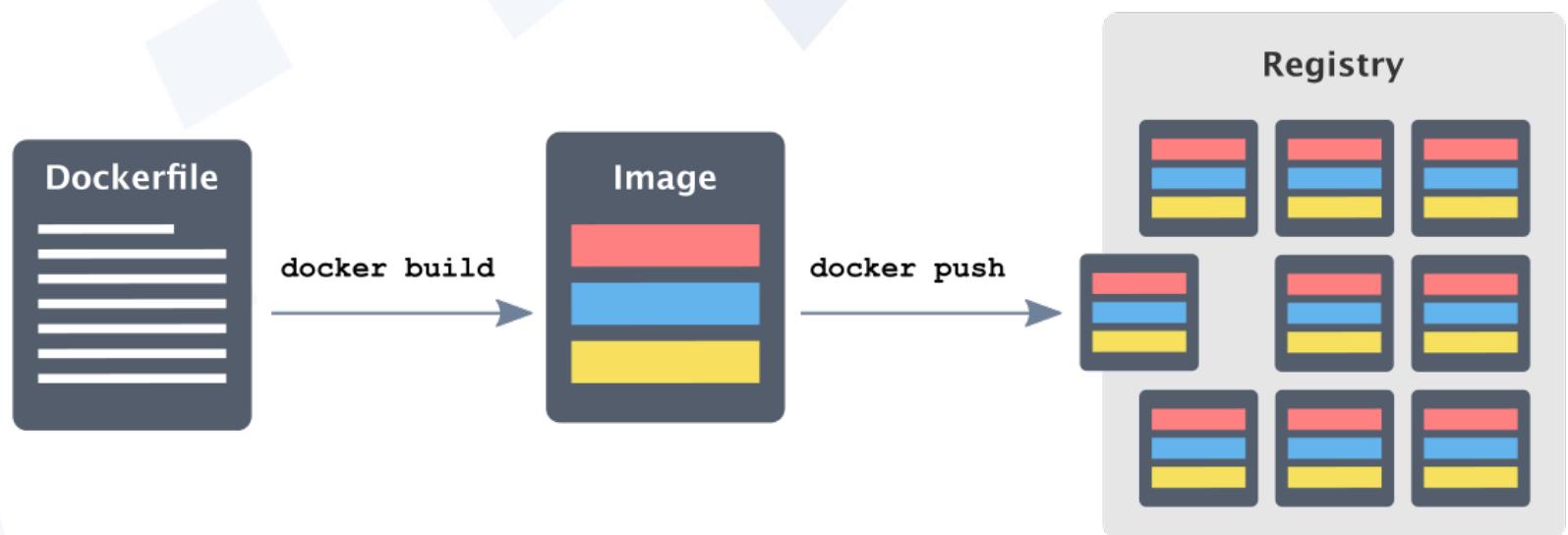
# What is a Docker Container?

- Isolated space for running applications
- Runs on the **host** kernel
- Isolated filesystem
- Namespaces for PID isolation
- Cgroups for limiting resources
- Separate networking stack
- Restricted root capabilities



# Building Containers using Dockerfiles

- FROM
- COPY
- RUN
- HEALTHCHECK
- ENTRYPOINT



<https://docs.docker.com/engine/reference/builder/>





# Questions?

# Intro to Kubernetes and Azure Kubernetes Service (AKS)

By Facundo



# Kubernetes

# Introduction

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

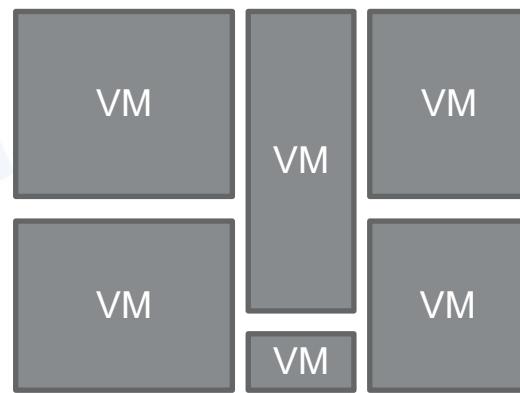


# Why?

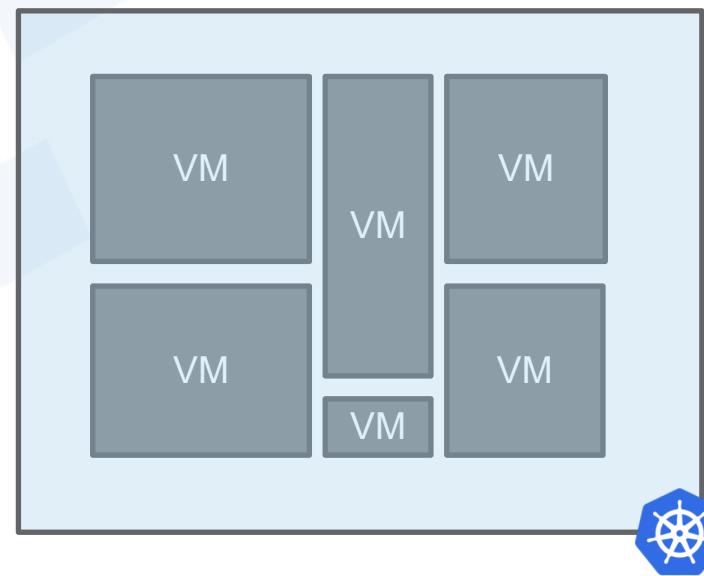
- Containers create scalability challenges
- Allows you to view the data center as a computer



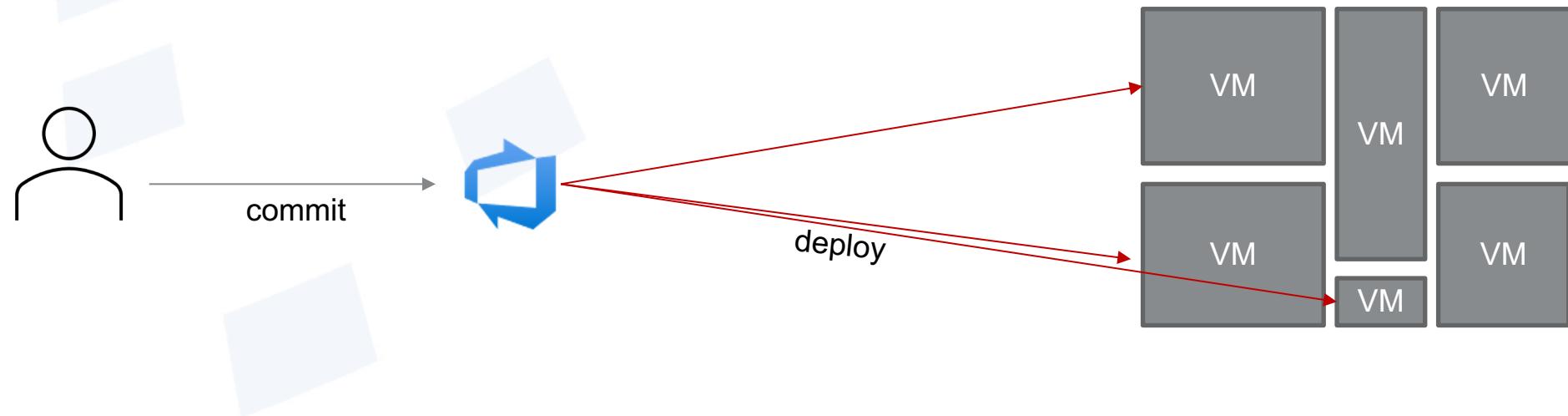
# Data center as a computer



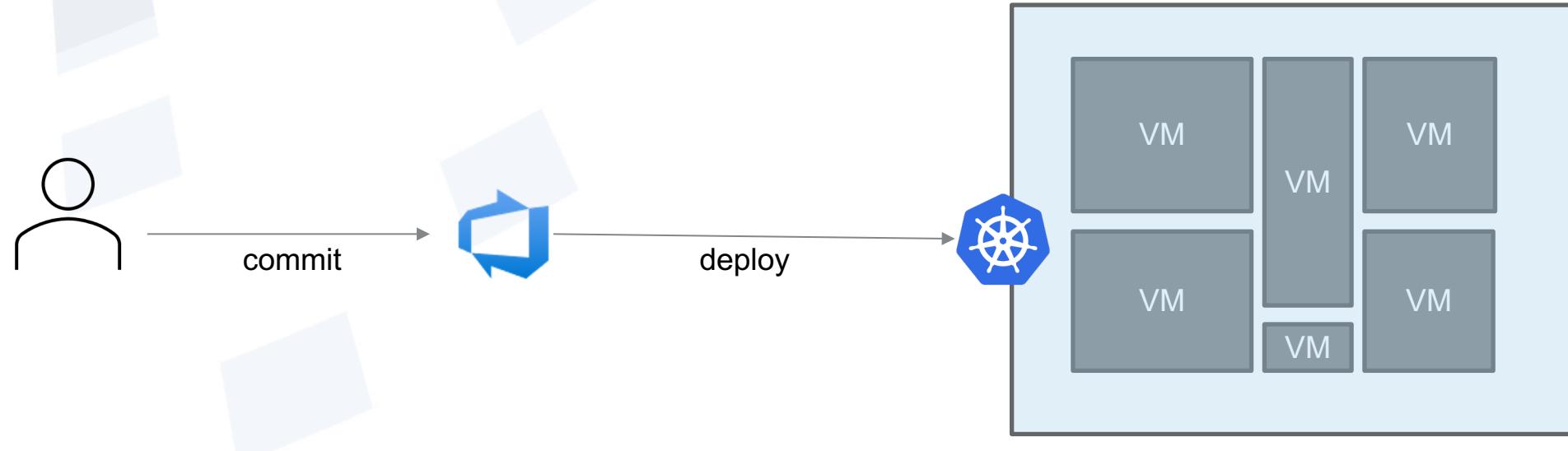
# Data center as a computer



# Data Center as Computer



# Data Center as Computer



# What does Kubernetes do?

Abstracts away the underlying hardware

Provides a general compute resources

Provides an API to create, configure, and deploy applications

- Declarative configuration management through YAML



# Key Benefits

## Operational

- Simplifies hardware deployment to cloud and on-premise datacenters
- Resilient architecture – tolerate total management plane failure
- Dynamically handle variable load (2-tier)
- Fine-grained access controls
- Native integration to public cloud
- Fully-featured REST API for custom monitoring
- Control over internal networking
- Customizable application scheduling

## Technical

- Automatic application healing
- Deploy applications in high availability
- Zero downtime application updates
  - Rolling
  - Blue/Green
  - Canary
- Multiple networking paradigms
- Multiple ingress controllers and rule sets
- Fully-customizable objects



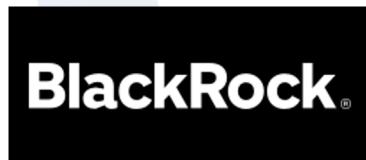
# Kubernetes Adoption Impact

## CI/CD Key Performance Indicators

- Deployment frequency **increased** 47%
- Speed of deployments **increased** 52%
- Deployment failure rate **decreased** from 25% to 6%
- Time to recovery **decreased** from 92 to 12 minutes



# Who Uses Kubernetes?

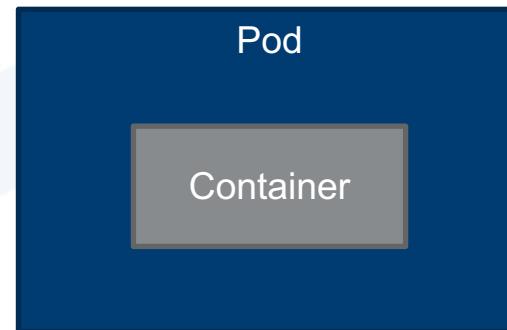


# Kubernetes Objects

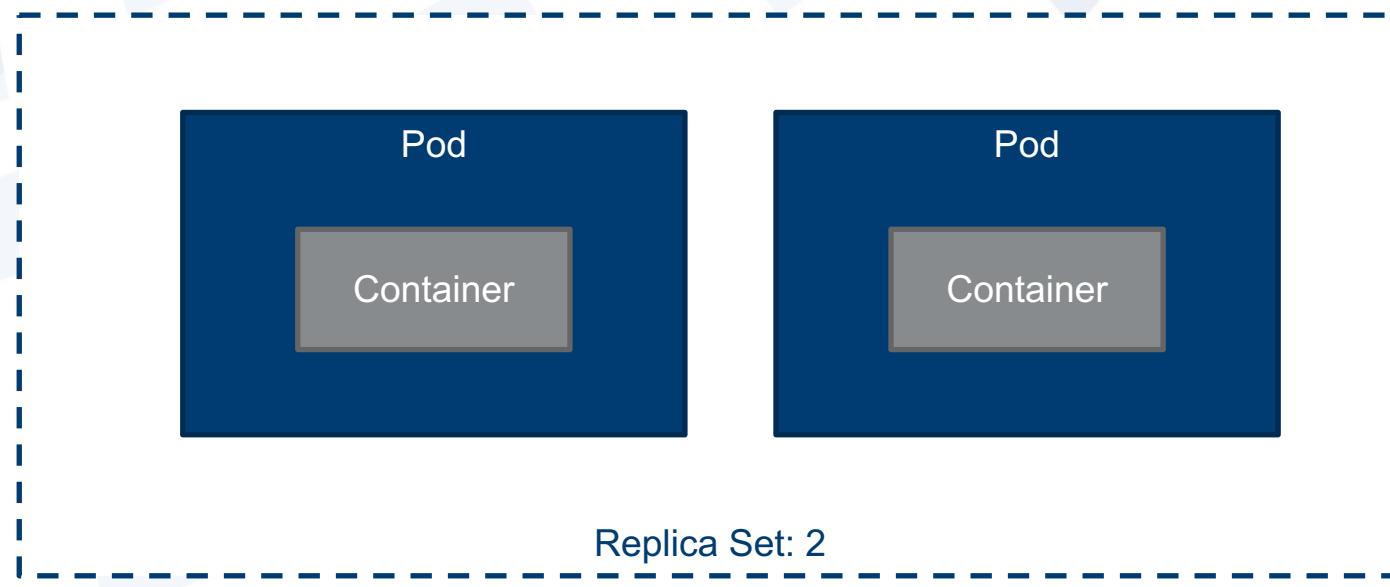
- **Node** – a host VM running containers
- **Pods** - your application containers
- **ReplicaSets** - maintains high availability
- **Deployments** – enable deployments of replicaset/pods
- **Services** - manage networking



# Pod



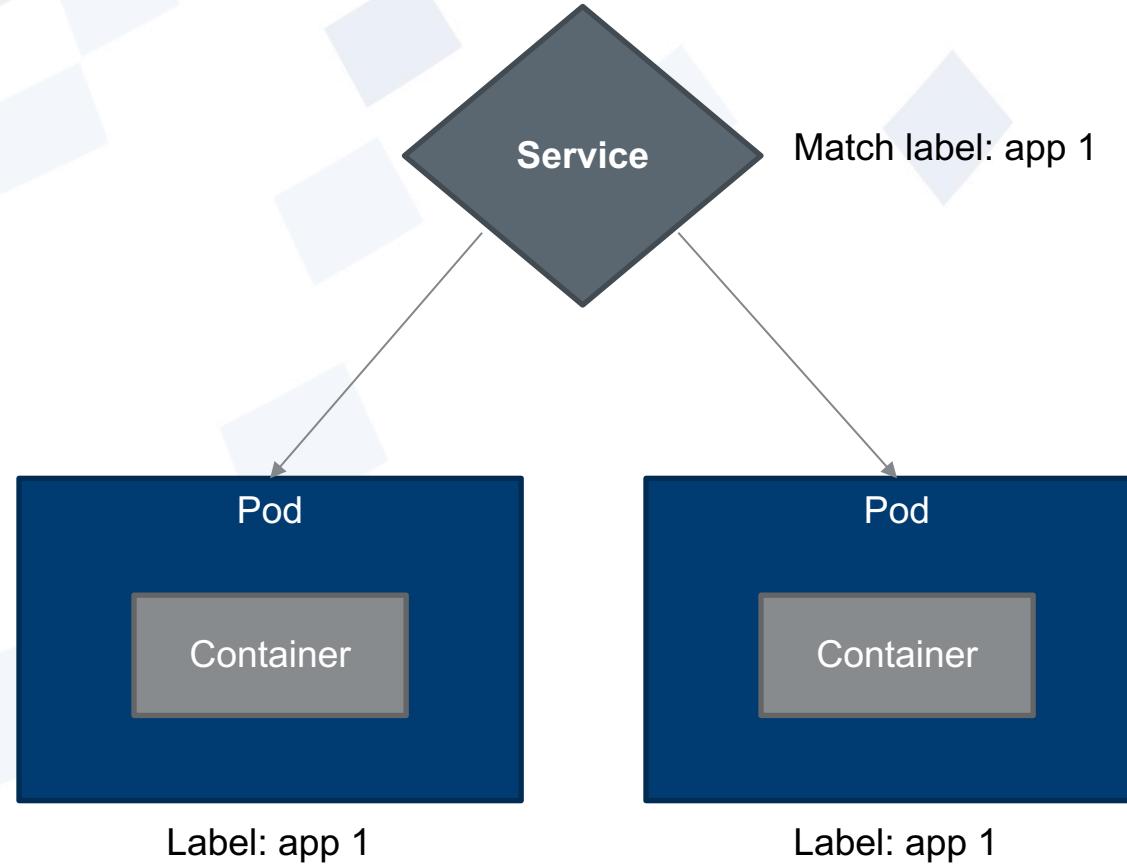
# Replica Sets



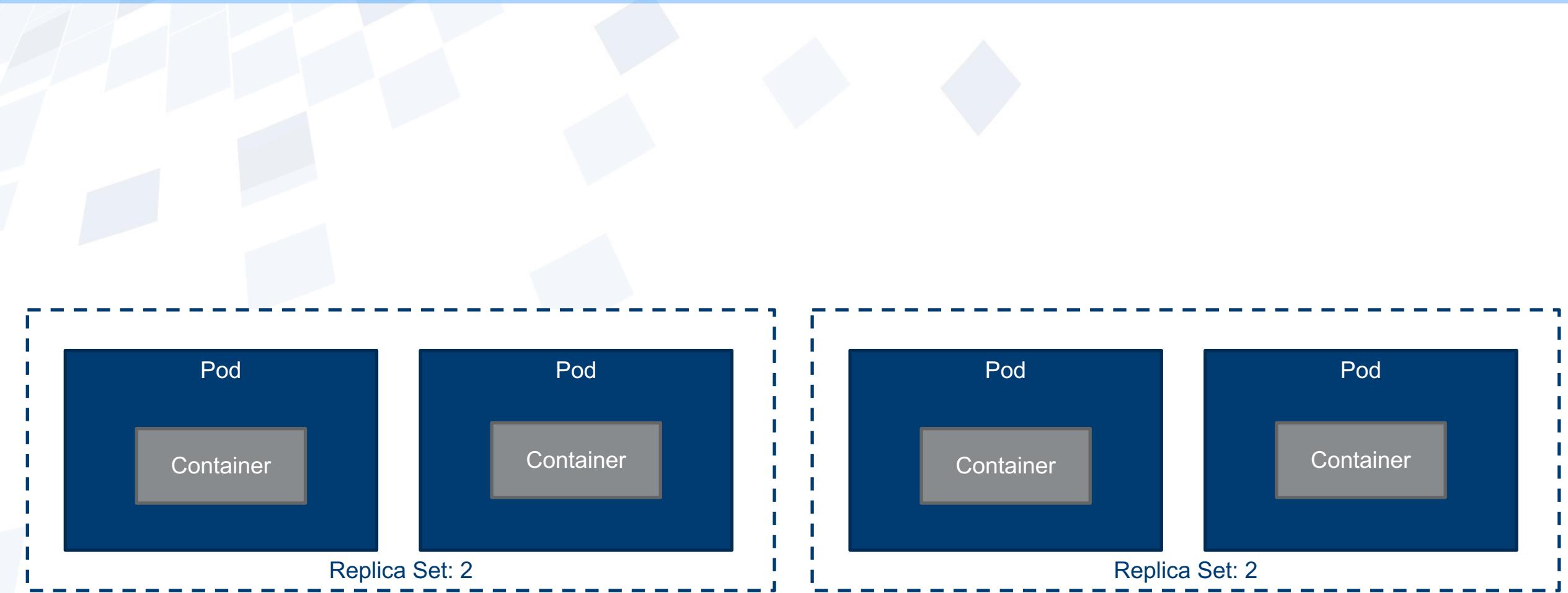
“I want two containers running at all times”



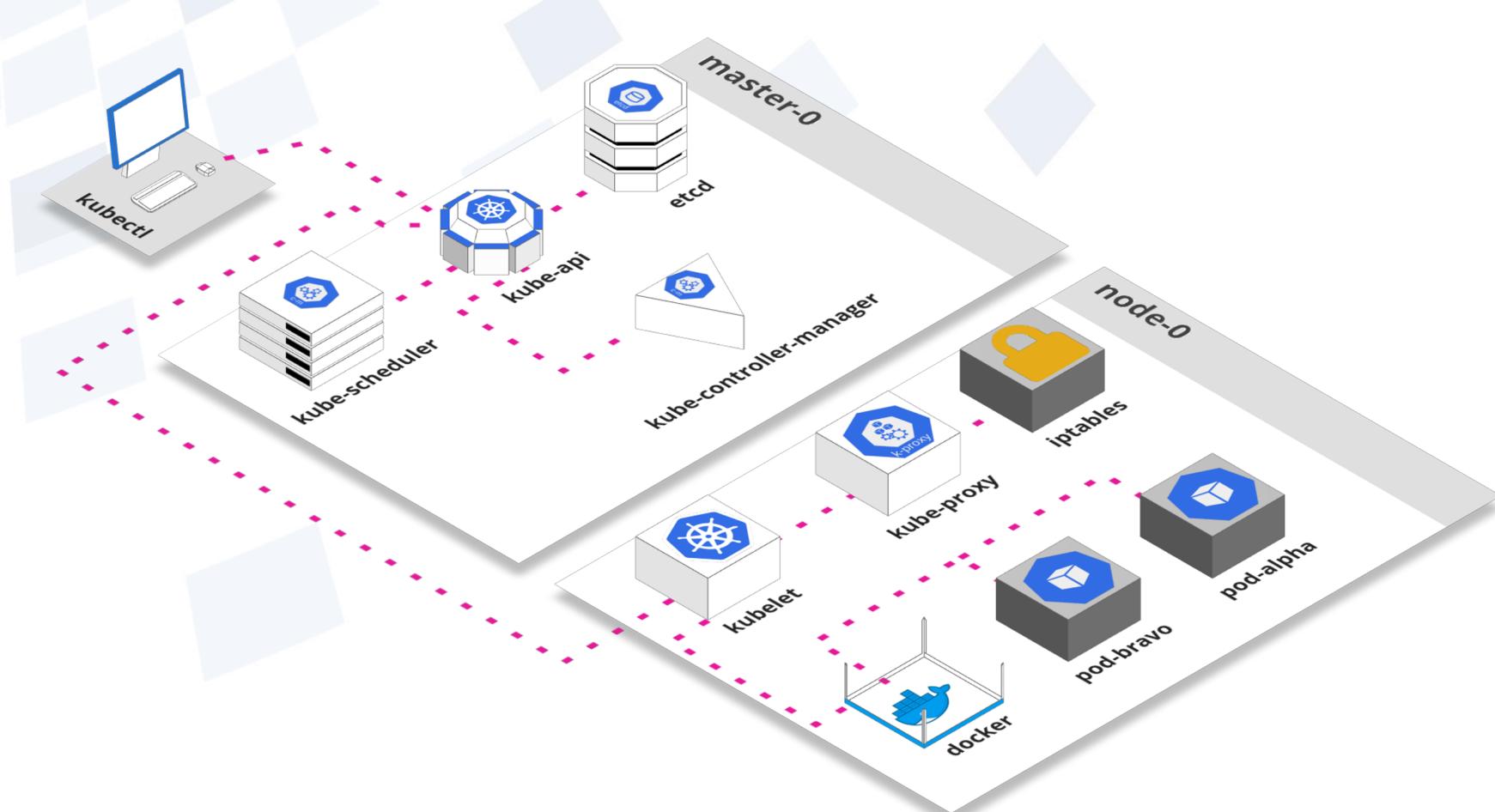
# Service



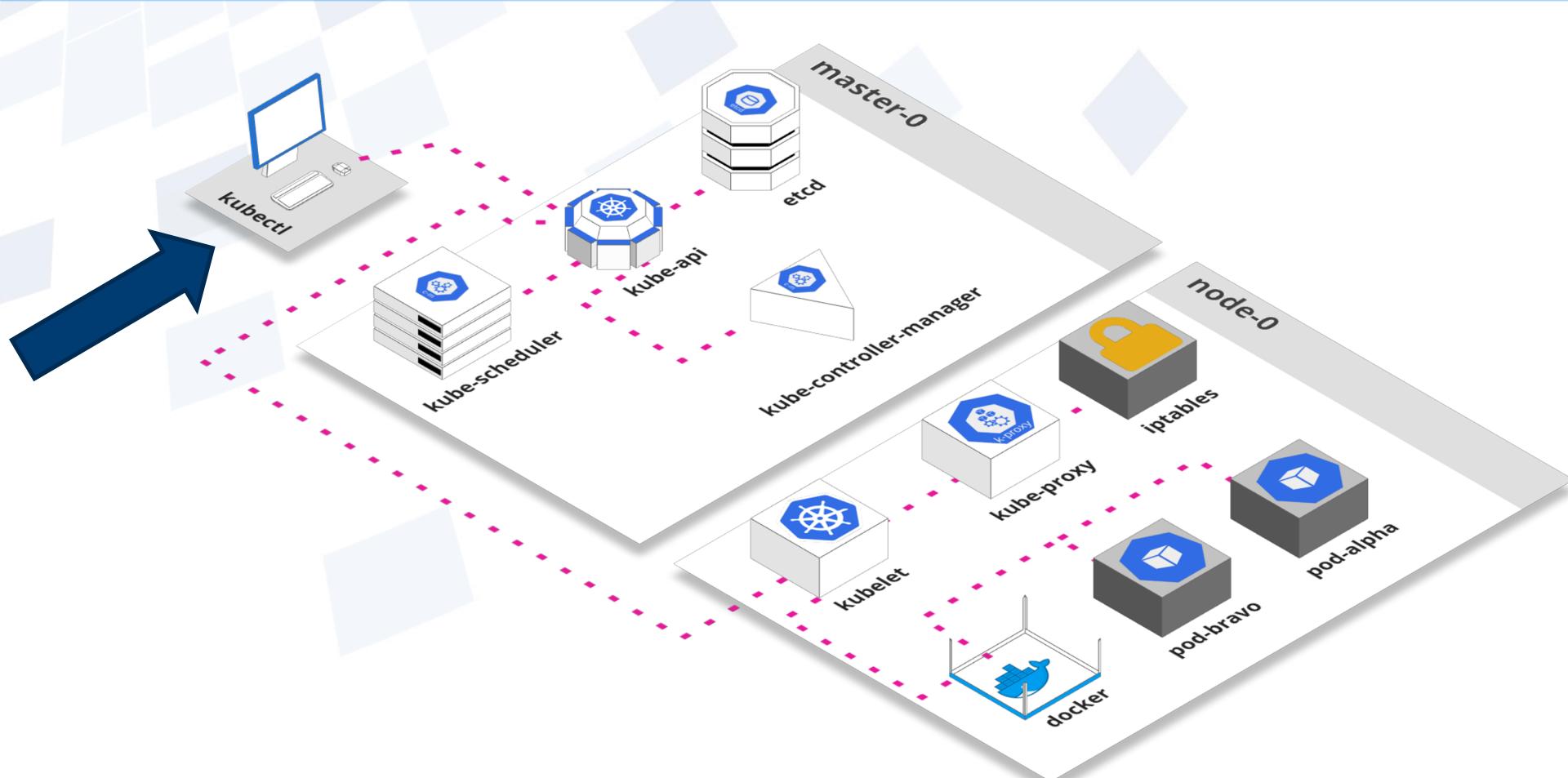
# Deployment



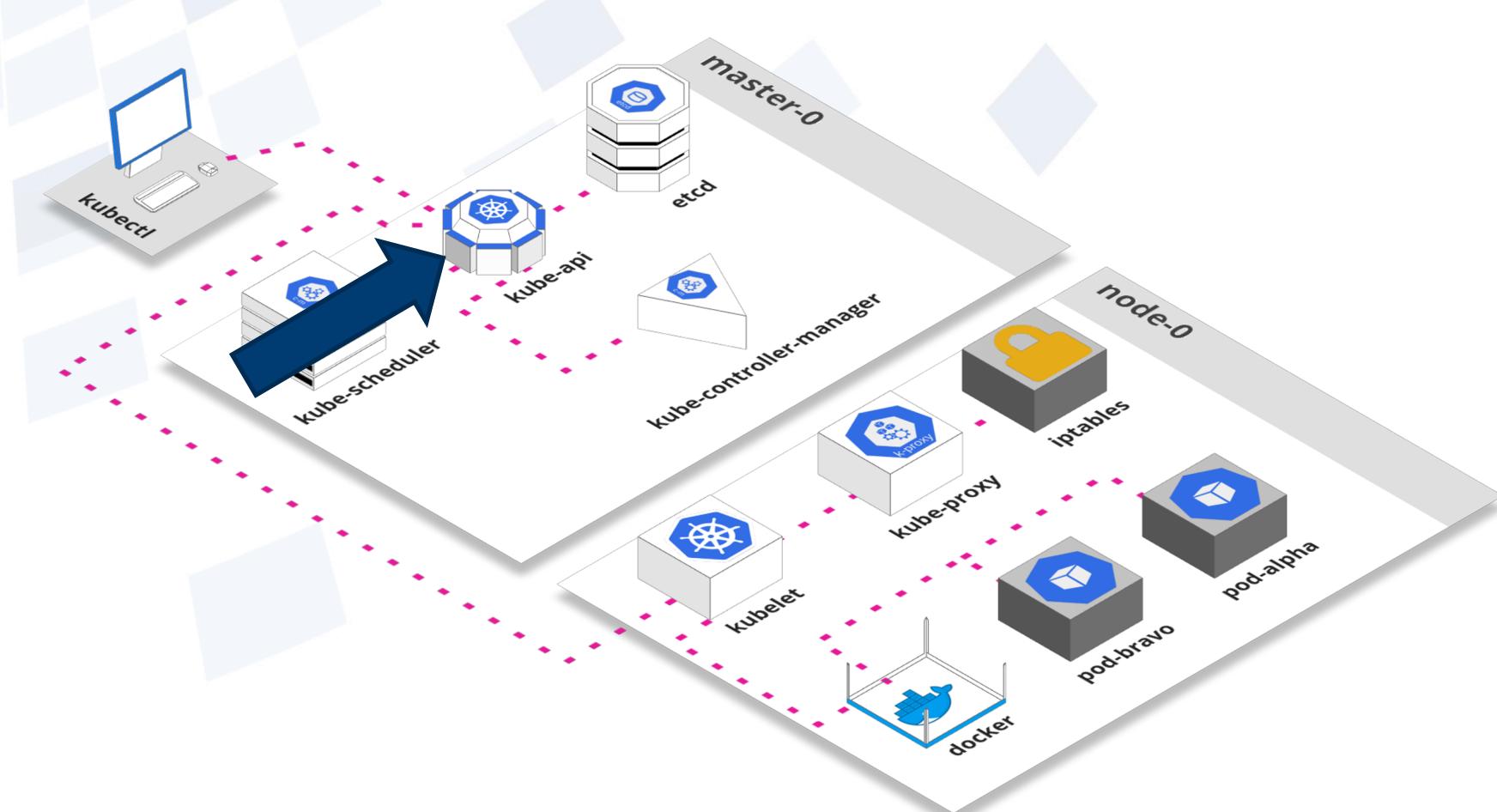
# Kubernetes Architecture



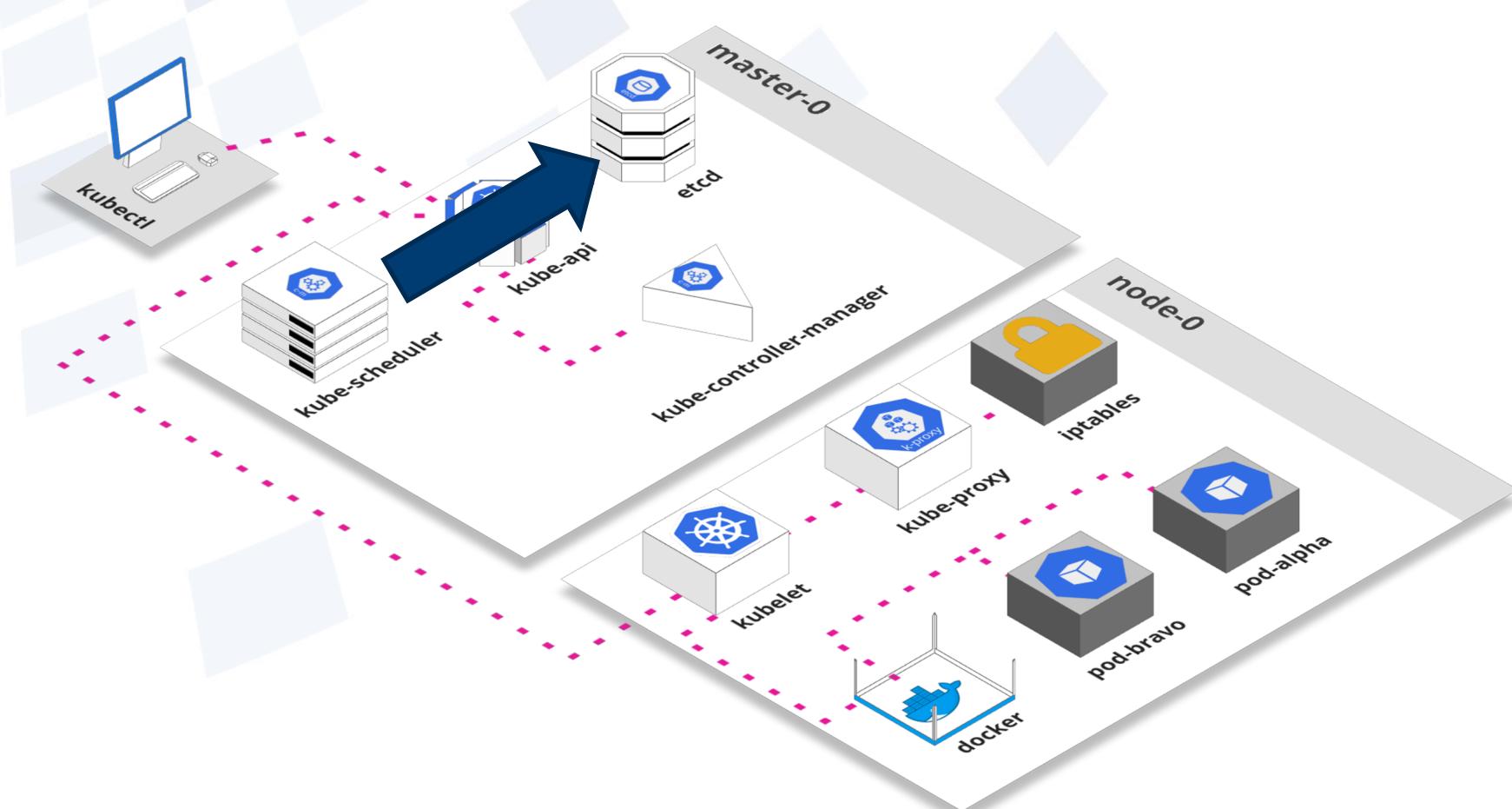
# Kubernetes Architecture



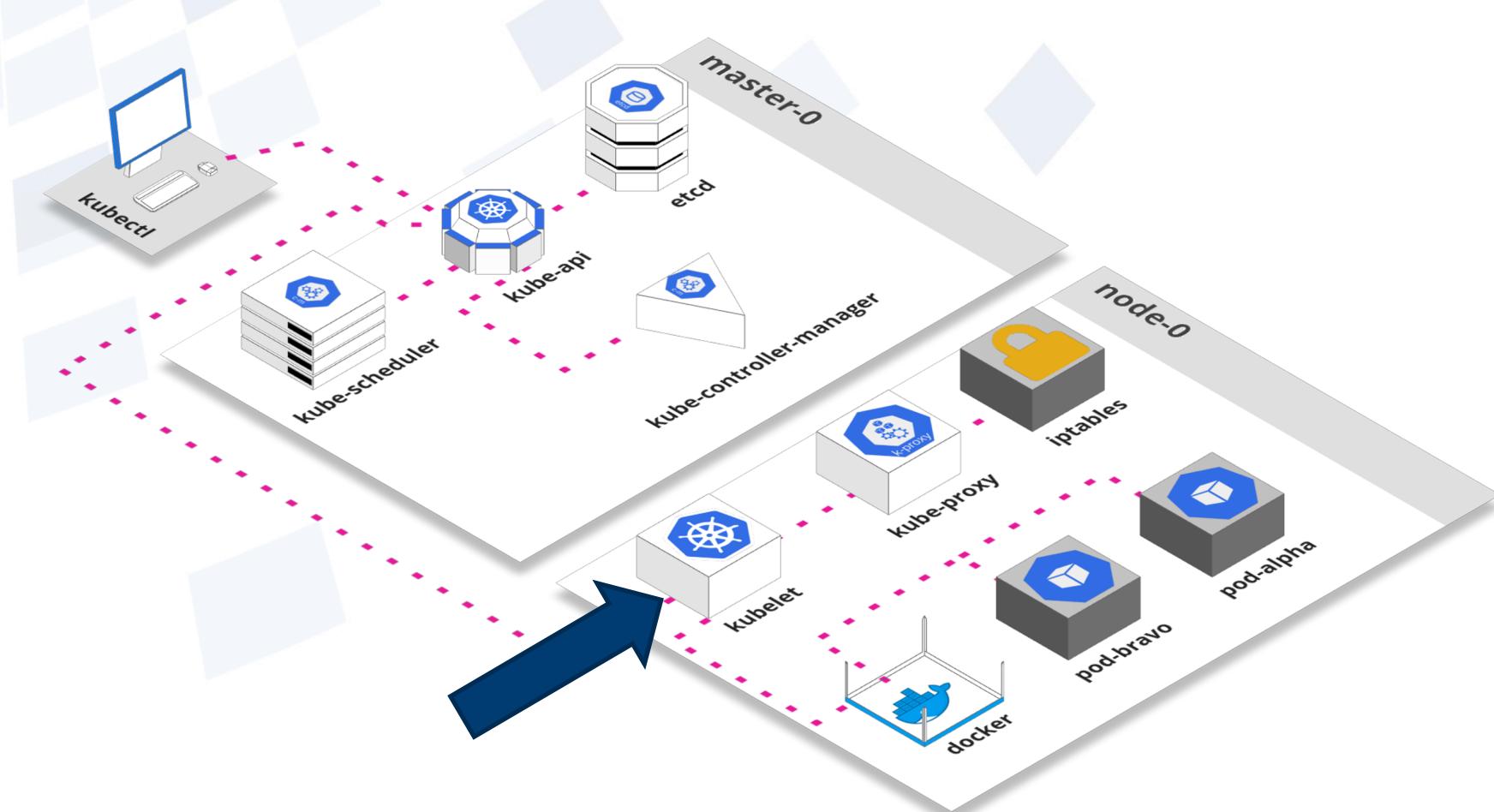
# Kubernetes Architecture



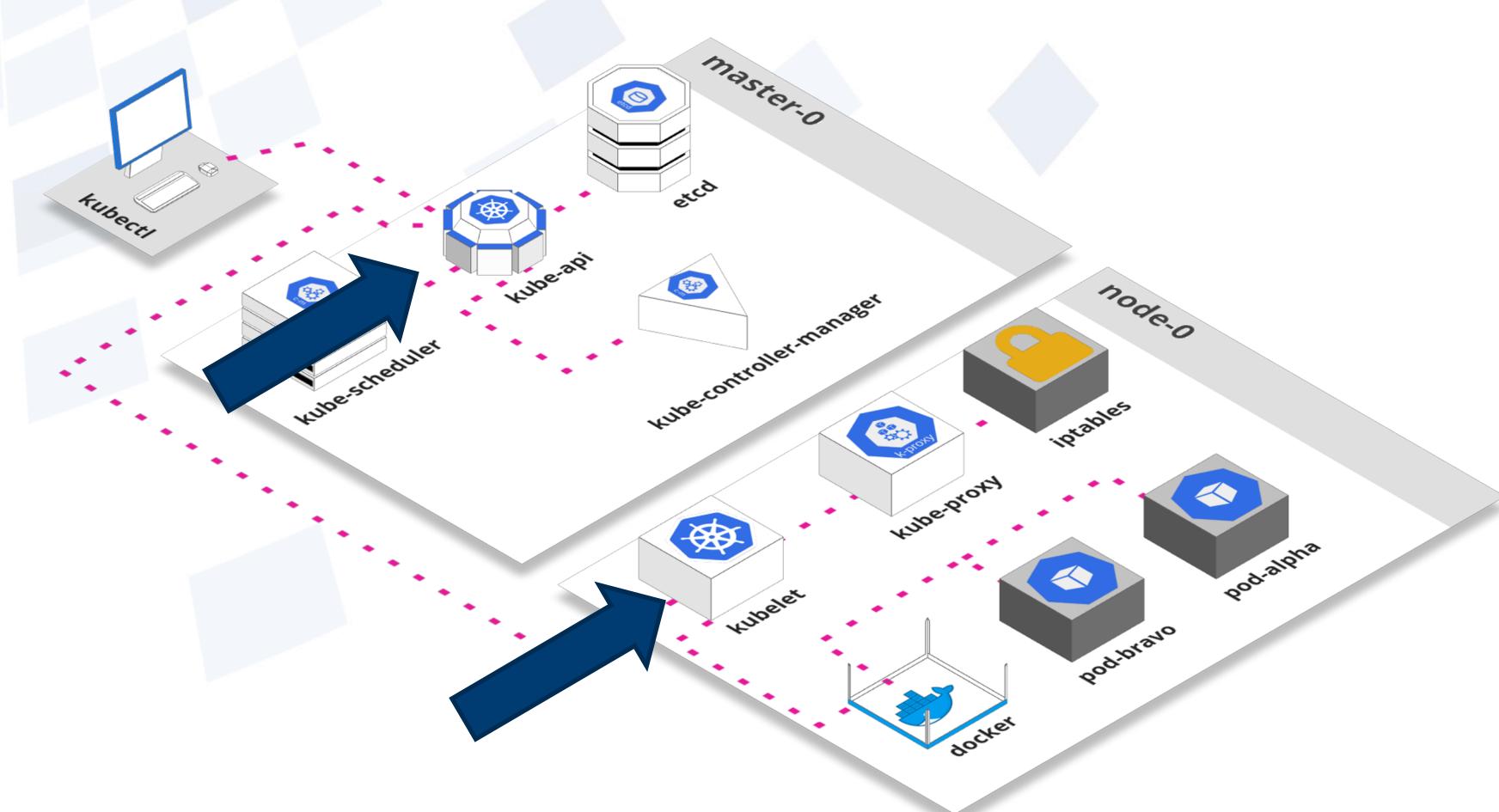
# Kubernetes Architecture



# Kubernetes Architecture



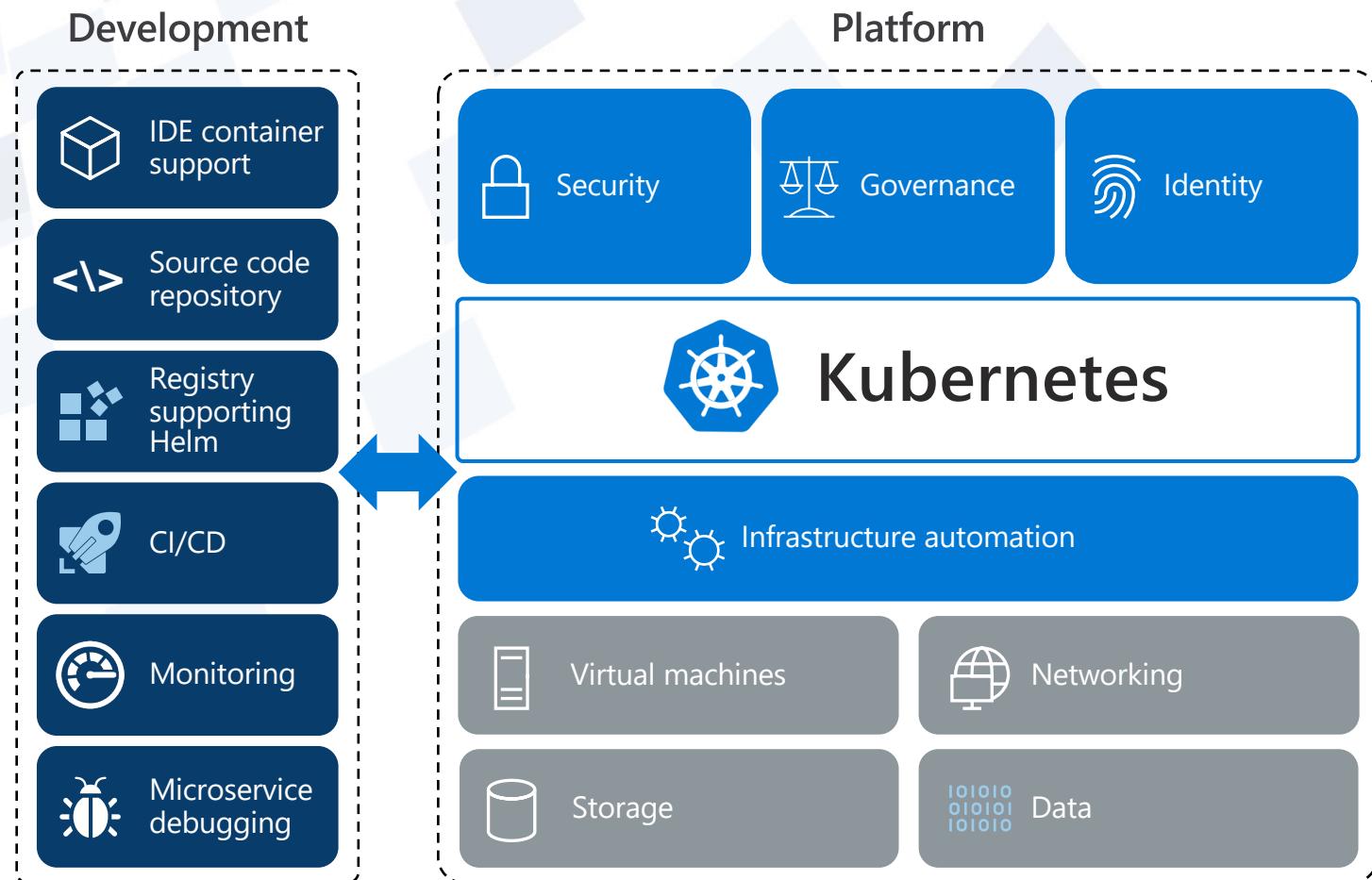
# Kubernetes Architecture



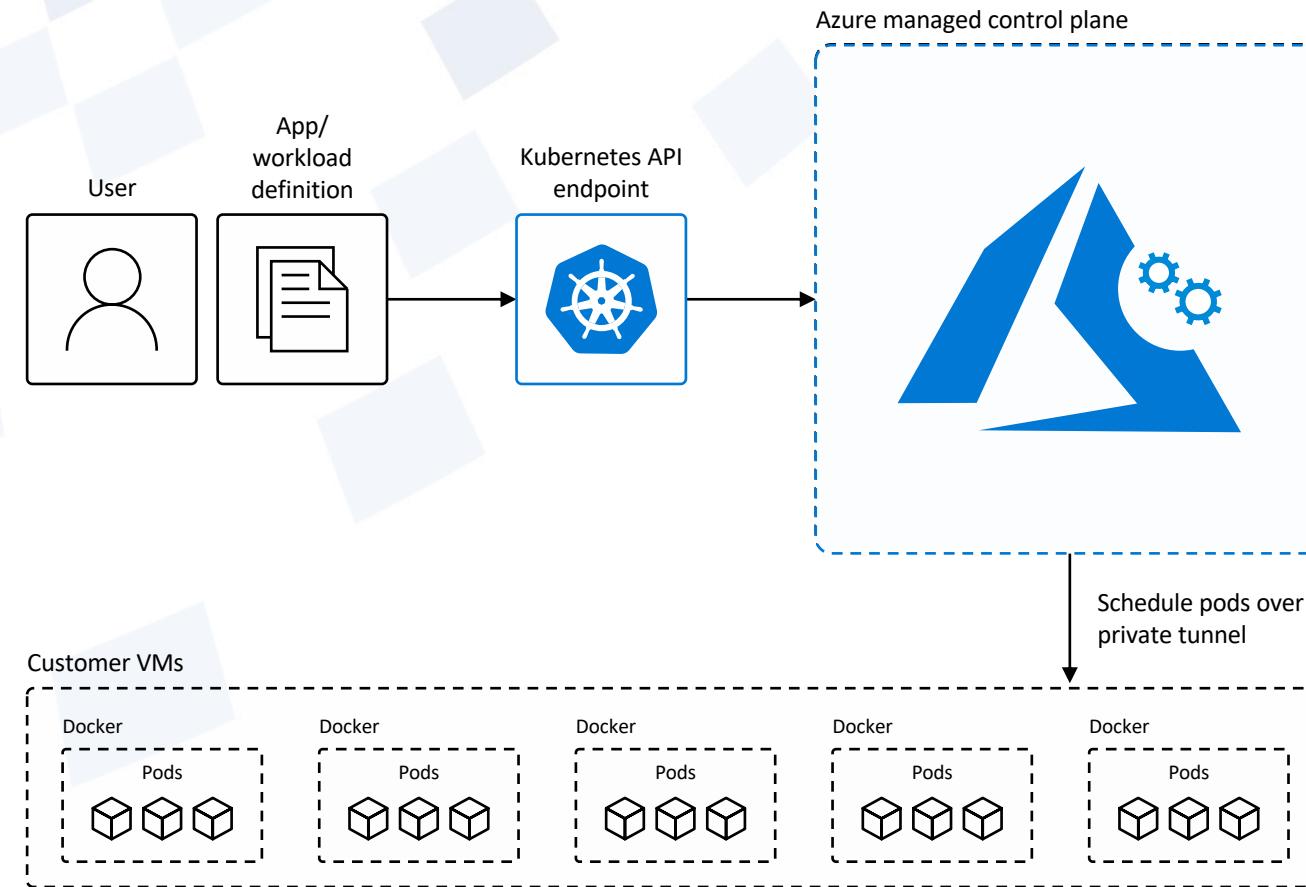
# Quick Cool Demo

# Azure Kubernetes Service

# The ecosystem is important



# High-Level



# Azure Kubernetes Service

- Automated provisioning, upgrades, patches
- High reliability, availability
- Easy, secure cluster scaling



# Azure Kubernetes Service

- Rich integration with Azure services
  - API server monitoring
- Master control plane at no charge



# DYI vs Managed

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

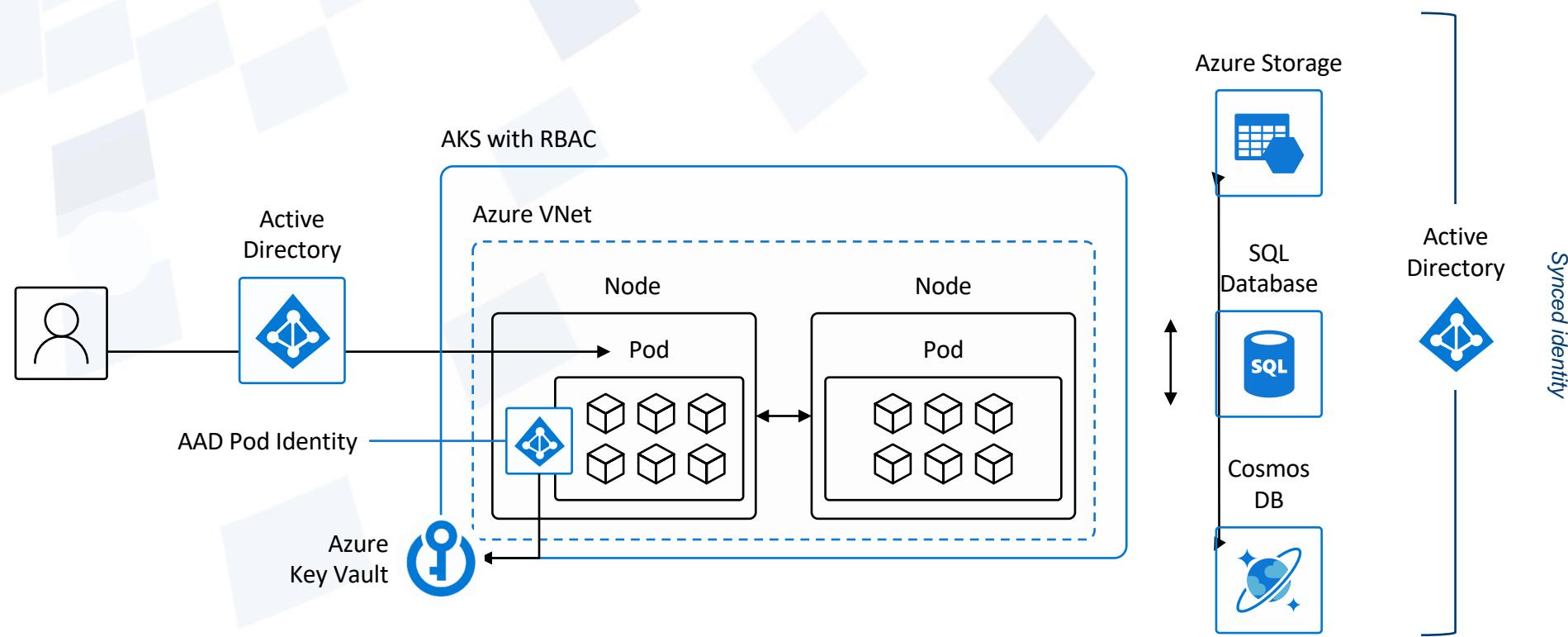
Your Team

Microsoft



| 59

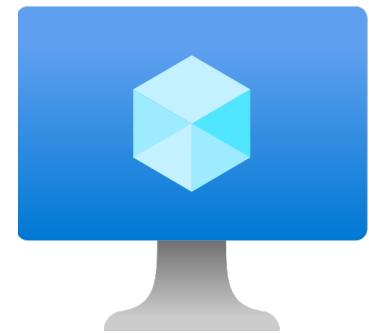
# Identity



# Azure Kubernetes Service in the Azure big picture

# Infrastructure as Service (IaaS)

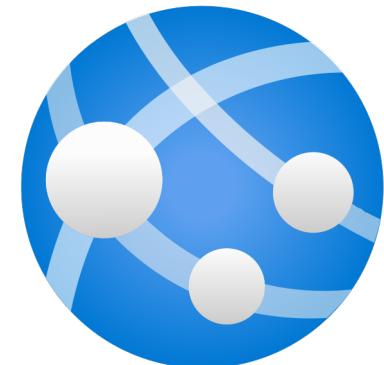
- Manage OS
- Manage Frameworks
- Manage Upgrades
- Manage Third-Party Software
- Manage Networking
- Pay for the hour



Virtual Machines

# Platform as Service (PaaS)

- Don't manage OS
- Don't frameworks
- Don't manage upgrades
- No third-party software on instances
- Limited networking options
- Micro-billing (serverless)



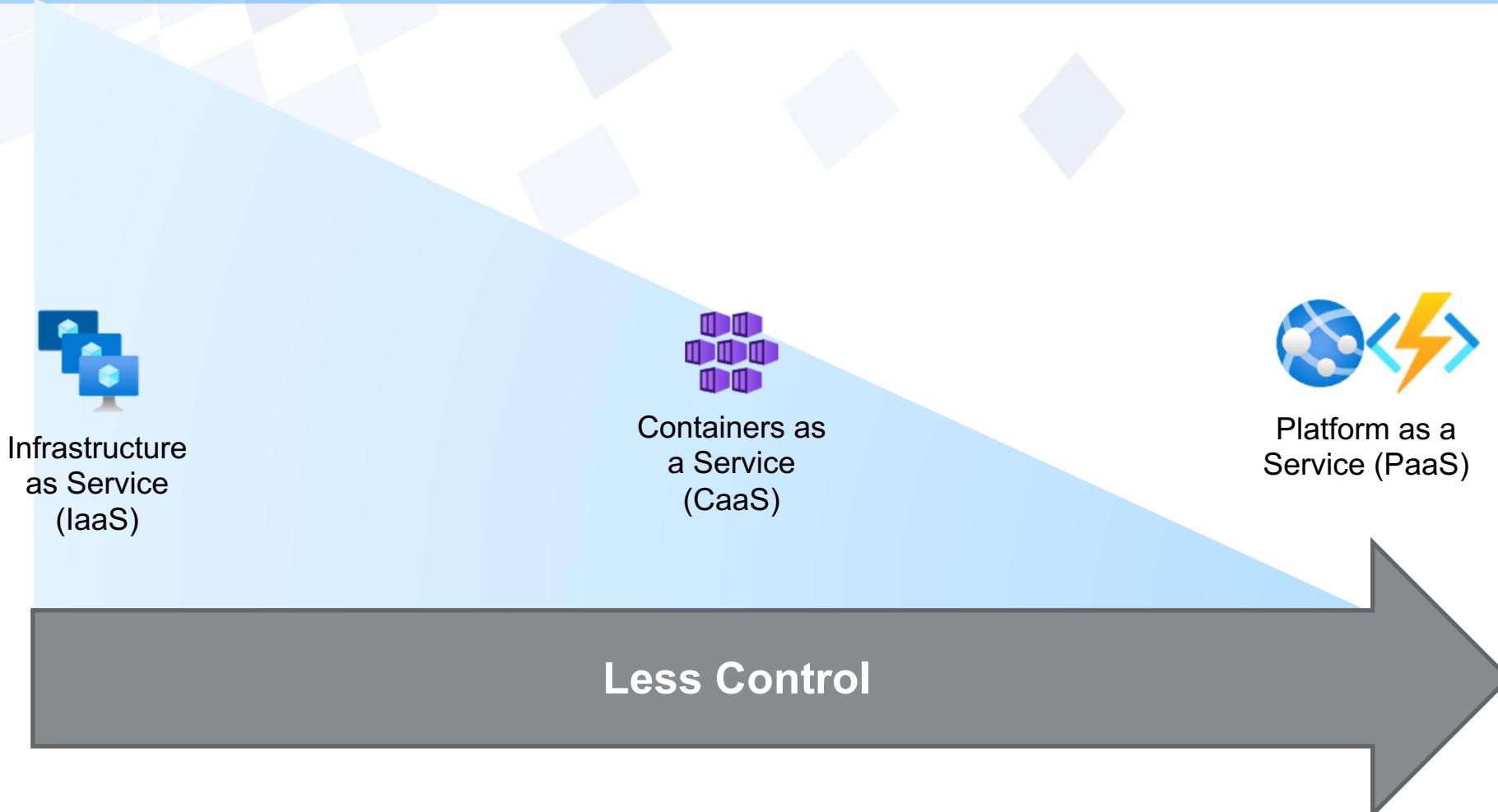
Azure Web Apps



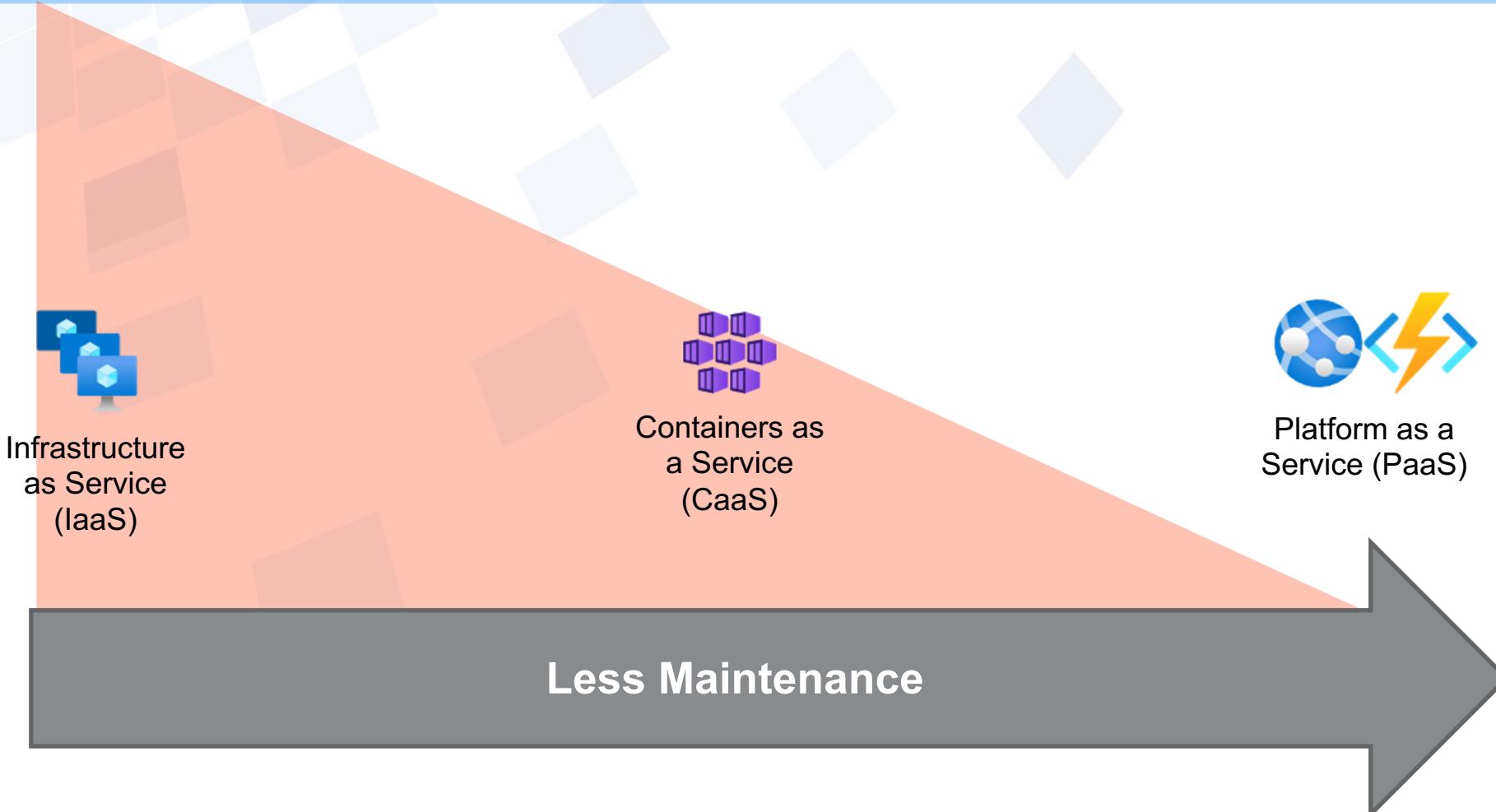
Azure SQL Database



# Hosting Models



# Hosting Models



# Pros

- High-control like Infrastructure as Service (IaaS)
- High agility like Platform as a Service (PaaS)
- Portable

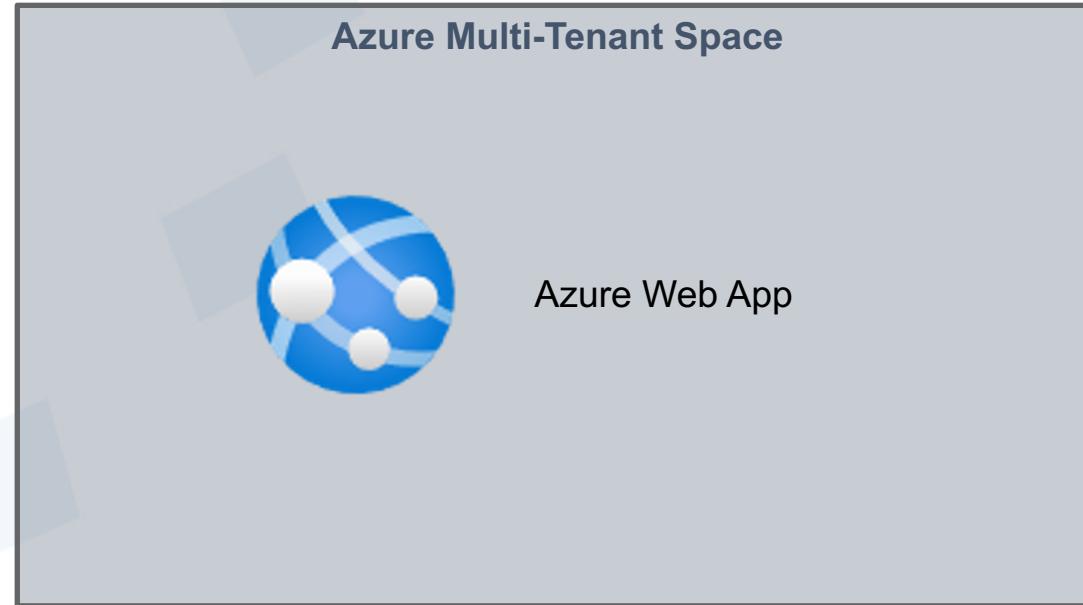


# Cons

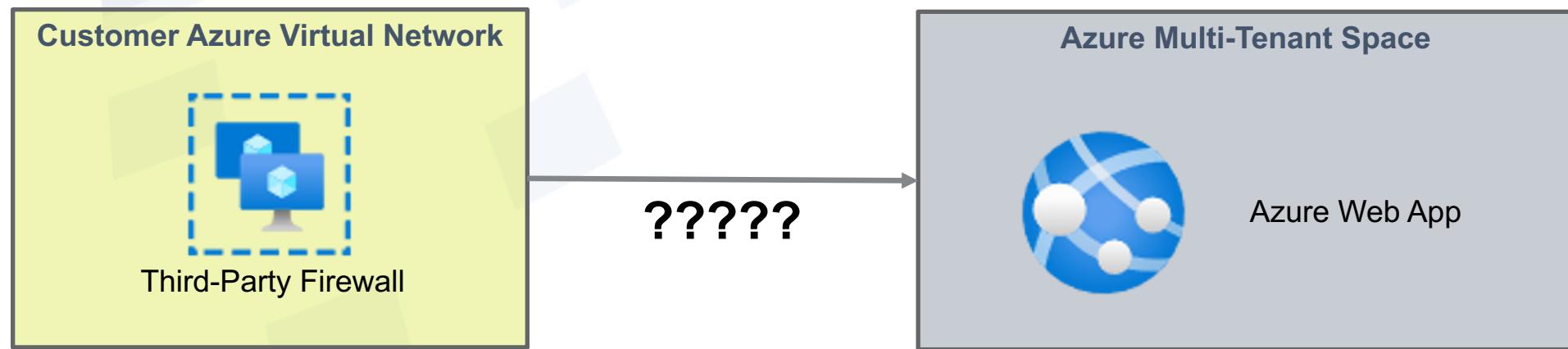
- Complex
- More management than Platform as a Service (PaaS)



# Do you need more control?



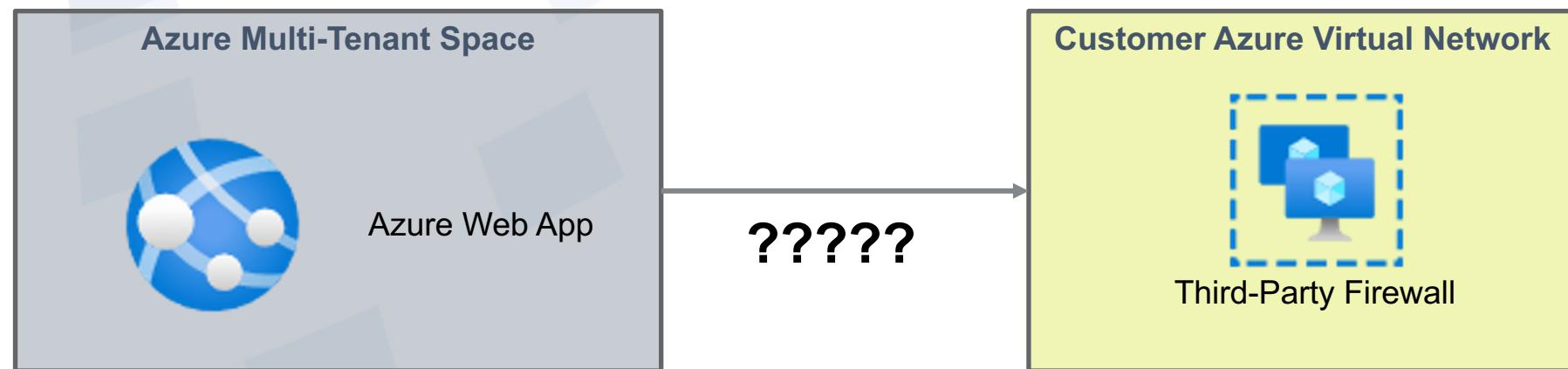
# "I want to add a third-party firewall"



Do I use an App Service Environment?



**"I want all outbound traffic to go through a network appliance"**

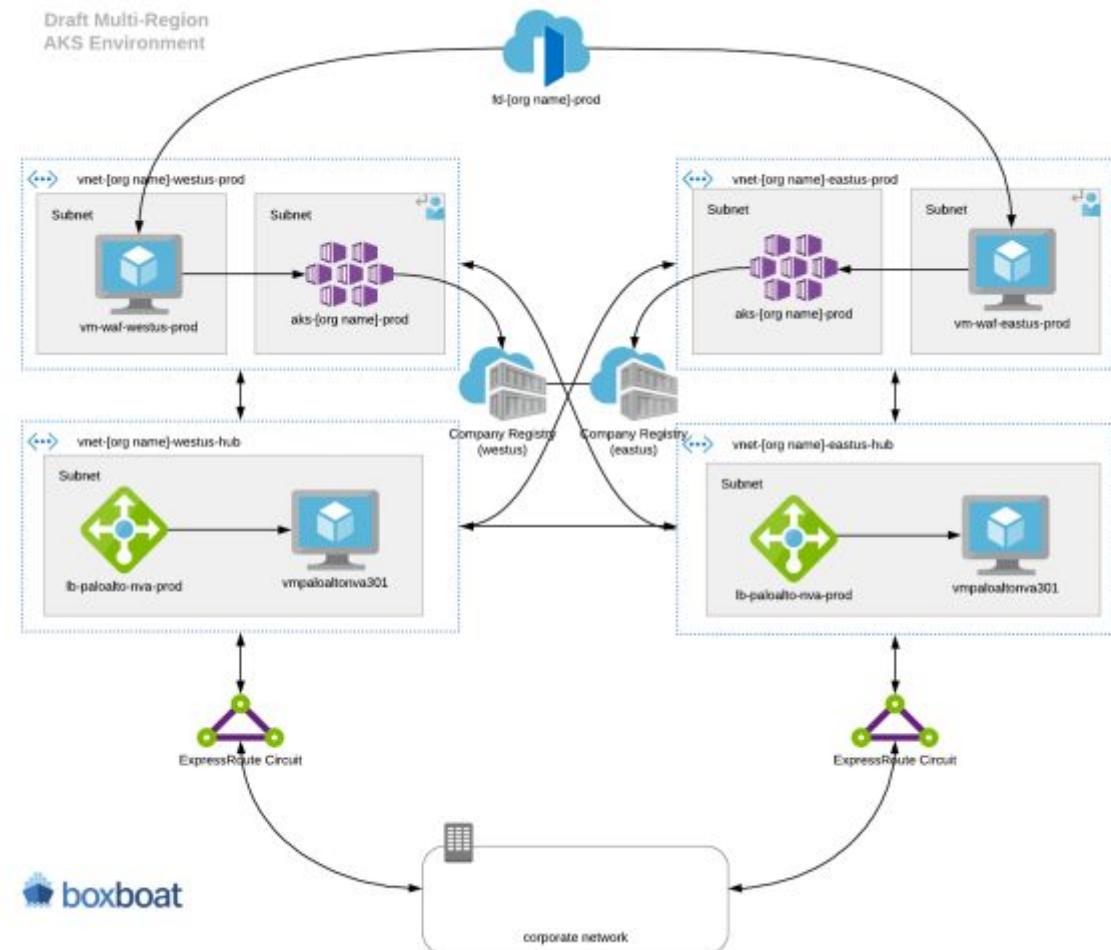


Do I use an App Service Environment?



# More Control

- Deploy on complex hub/spoke architectures
- Employ strict policies on running workloads
- Flexible for all workloads



# AKS / Kubernetes Lab

By Facundo



# Closing out



# Kubernetes is hard

- We're happy to help
- The ecosystem around it is large. It can be *overwhelming*.
- With great power, comes great responsibility.



# The future is bright

- AKS is one of the fastest growing Azure services ever.
- The community continues to grow.
- The platforms on it continue to grow.



# Contact Us



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