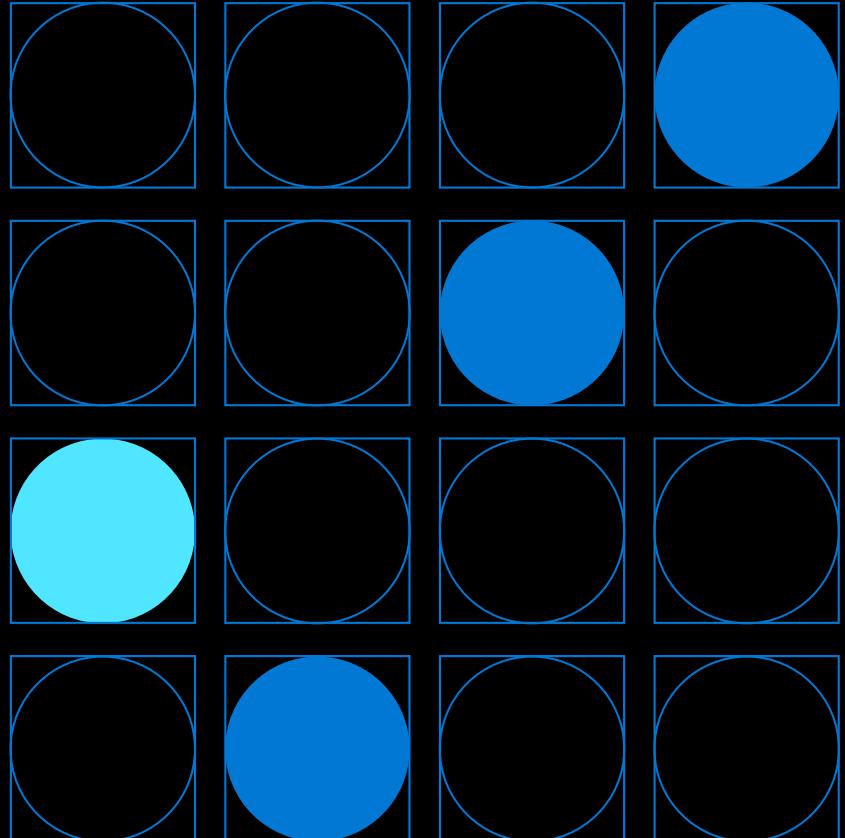


# Microsoft Azure Developer Camp



# Fundamentals of Kubernetes on Microsoft Azure



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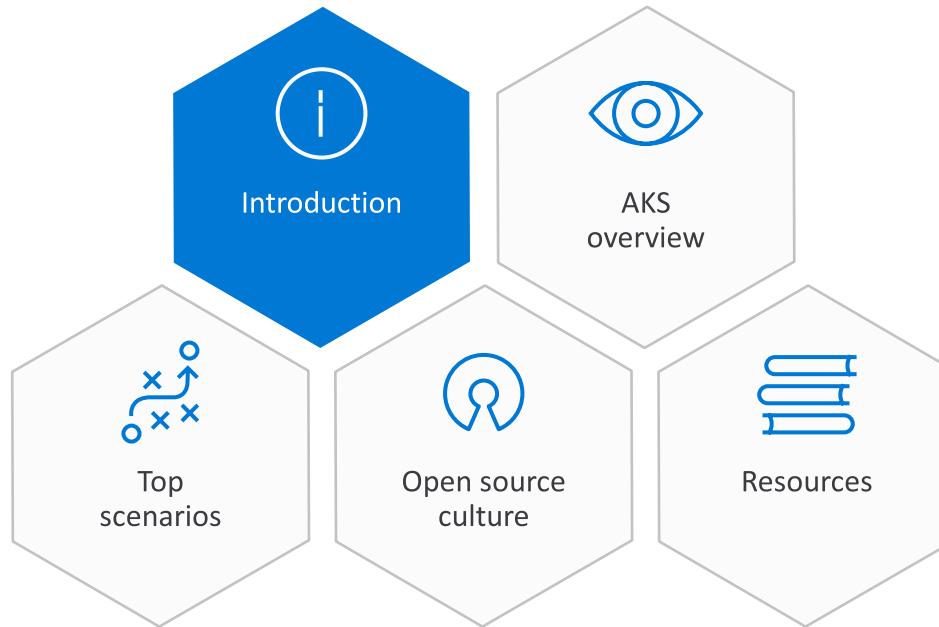


@marekgrabarz



<https://www.linkedin.com/in/grabarz/>

# Introduction

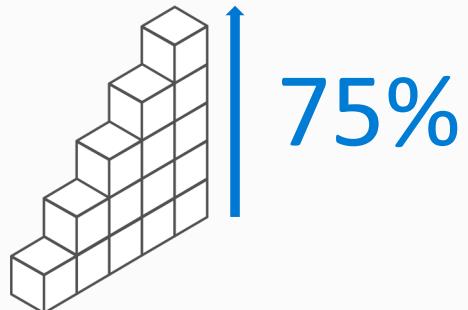


# Containers and Kubernetes momentum

"By 2020, more than **50%** of enterprises will run **mission-critical, containerized cloud-native applications** in production."

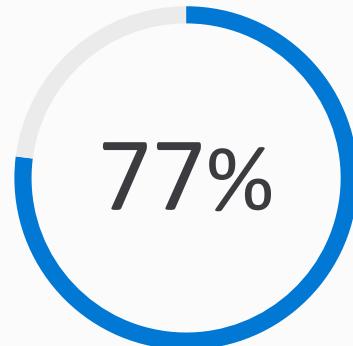
**Gartner**

The average size of a container deployment has grown 75% in one year.<sup>1</sup>



Half of container environment is orchestrated.<sup>1</sup>

77% of companies<sup>2</sup> who use container orchestrators choose Kubernetes.



Larger companies are leading the adoption.<sup>1</sup>

Nearly 50% of organizations<sup>1</sup> running 1000 or more hosts have adopted containers.



<sup>1</sup> Datadog report 8 Surprising Facts About Real Docker Adoption

<sup>2</sup> CNCF survey: cloud-native-technologies-scaling-production-applications

# Kubernetes: the industry leading orchestrator



## Portable

Public, private, hybrid, multi-cloud



## Extensible

Modular, pluggable, hookable, composable

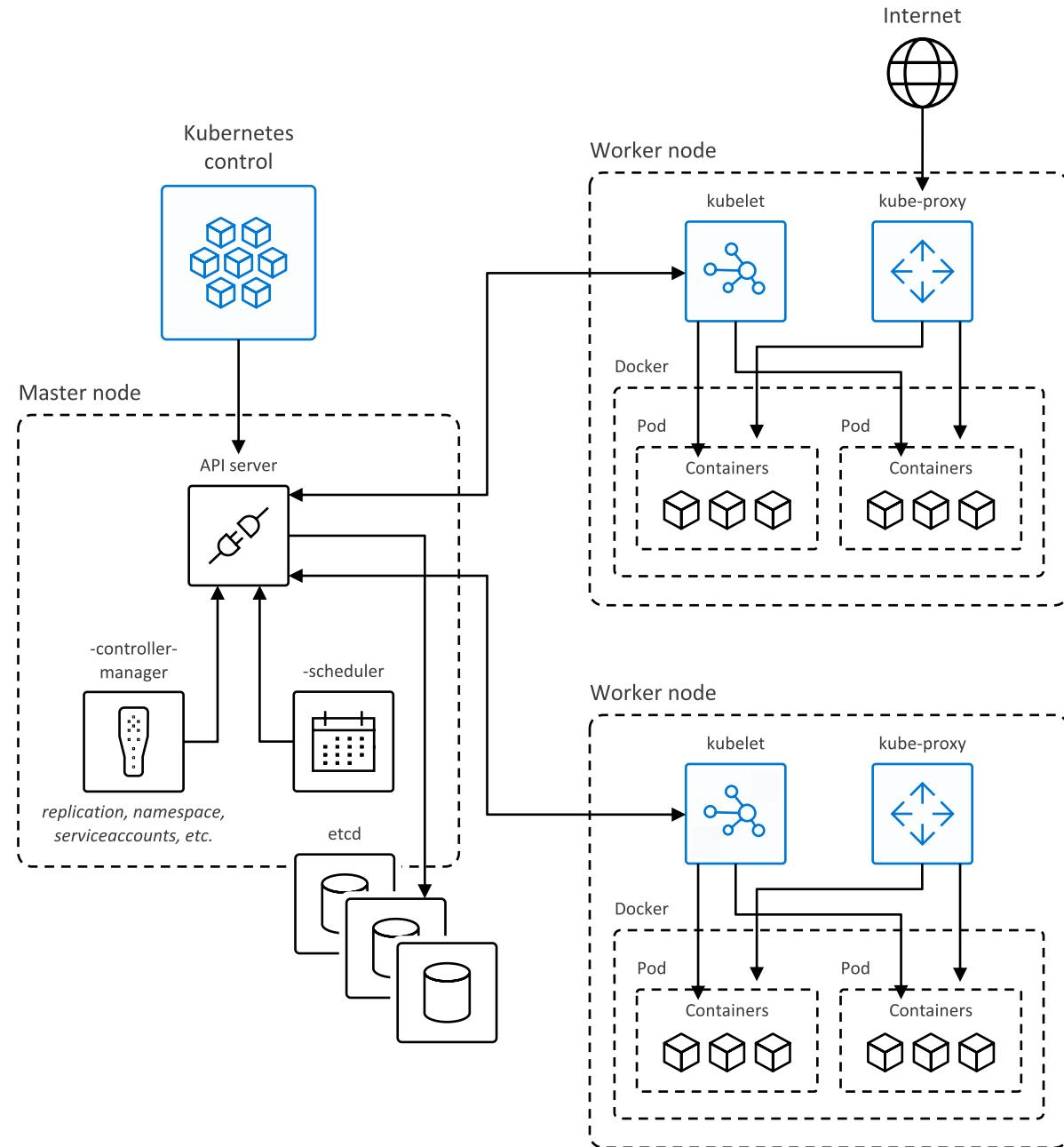


## Self-healing

Auto-placement, auto-restart, auto-replication, auto-scaling

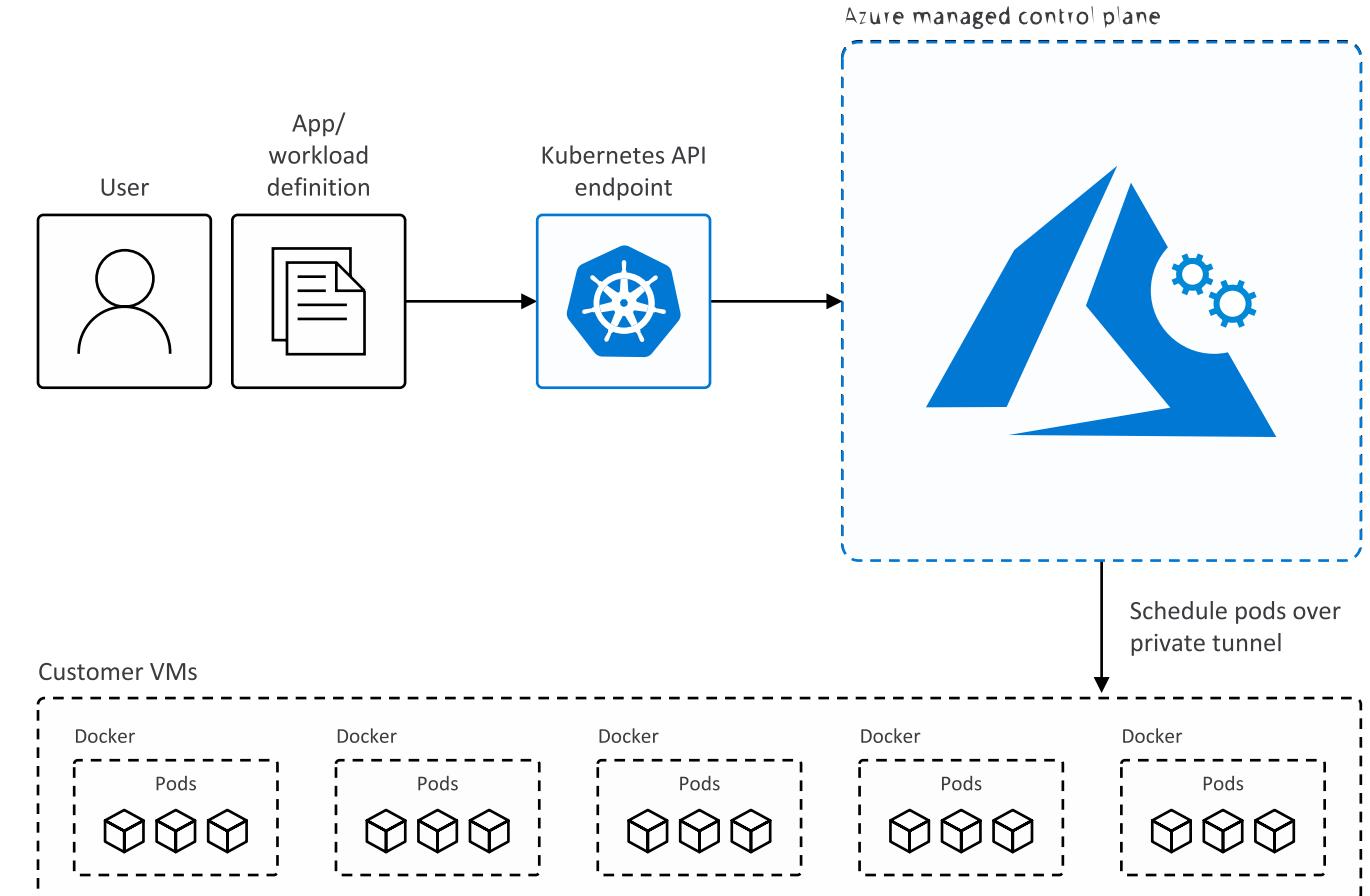
# Kubernetes 101

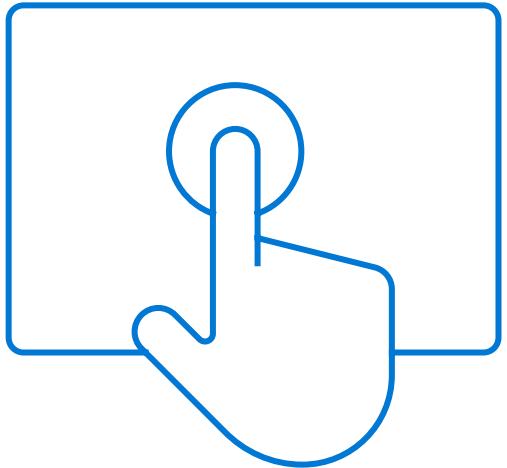
1. Kubernetes users communicate with API server and apply desired state
2. Master nodes actively enforce desired state on worker nodes
3. Worker nodes support communication between containers
4. Worker nodes support communication from the Internet



# How managed Kubernetes on Azure works

- Automated upgrades, patches
- High reliability, availability
- Easy, secure cluster scaling
- Self-healing
- API server monitoring
- At no charge





## Demo

Get started easily with AKS

Set up CI/CD in simple steps with DevOps Project



<http://bit.ly/31lYwol>

# From infrastructure to **innovation**

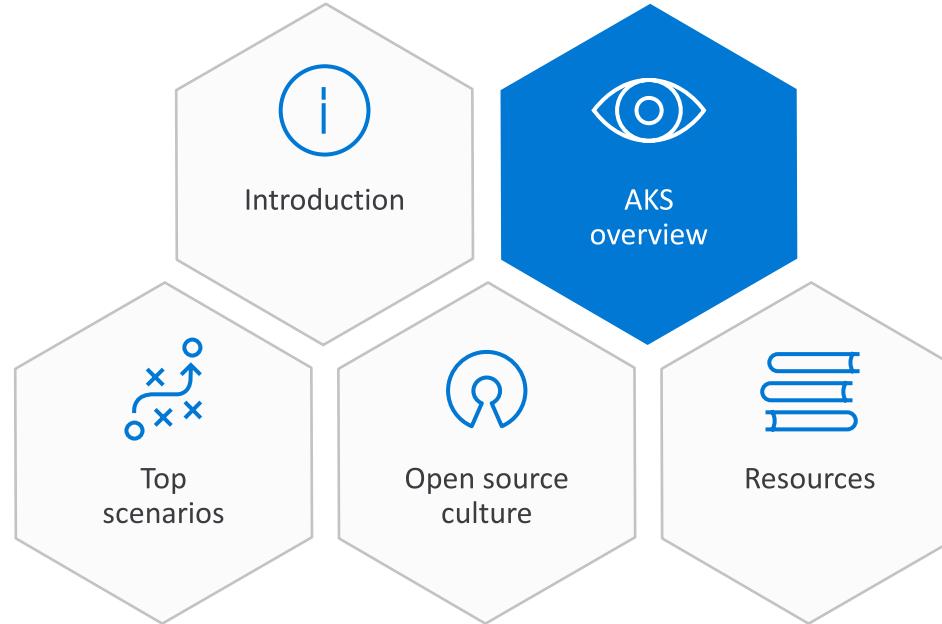
Managed Kubernetes  
empowers you to do more

Focus on your containers and  
code, not the plumbing of  
them

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

 Customer  
 Microsoft

# Azure Kubernetes Service (AKS) Overview



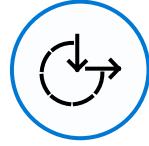
# AKS: Simplify the deployment, management, and operations of Kubernetes



Deploy and manage  
Kubernetes with ease



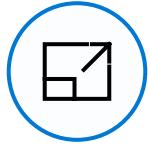
Accelerate containerized  
application development



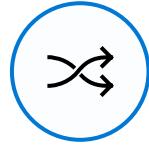
Set up CI/CD in a  
few clicks



Secure your Kubernetes  
environment

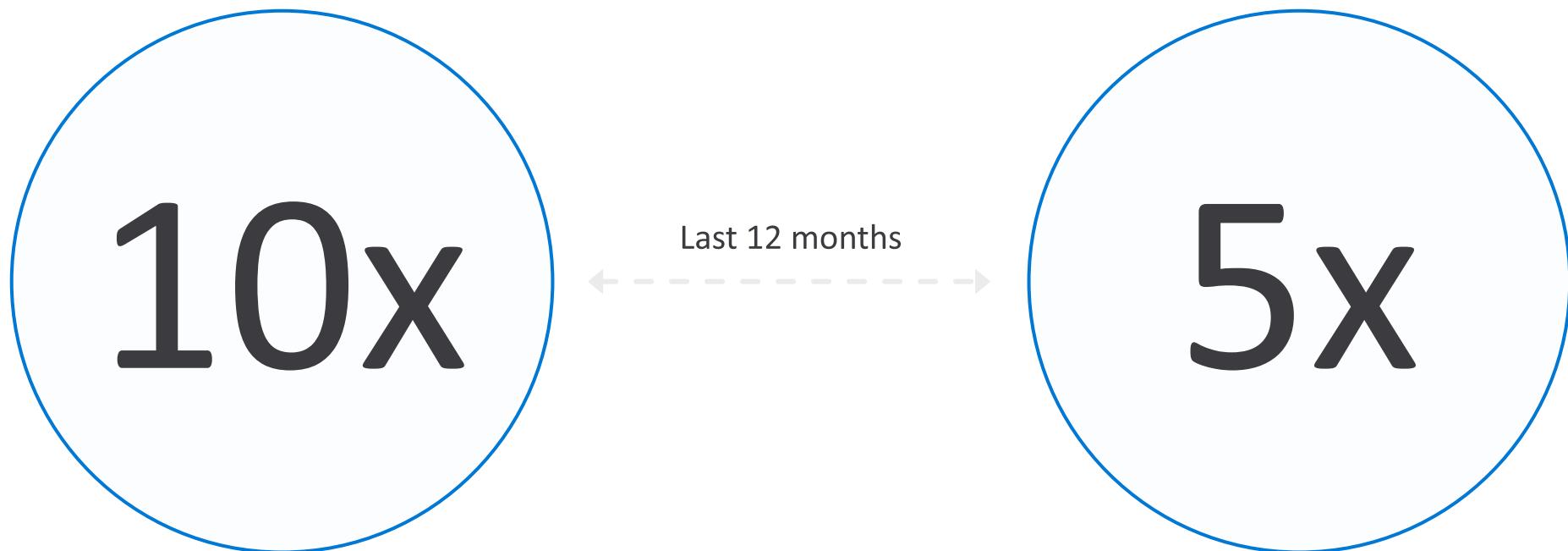


Scale and run applications  
with confidence



Work how you want with open-  
source tools and APIs

## Azure Kubernetes momentum



Kubernetes on Azure  
usage grew 10x

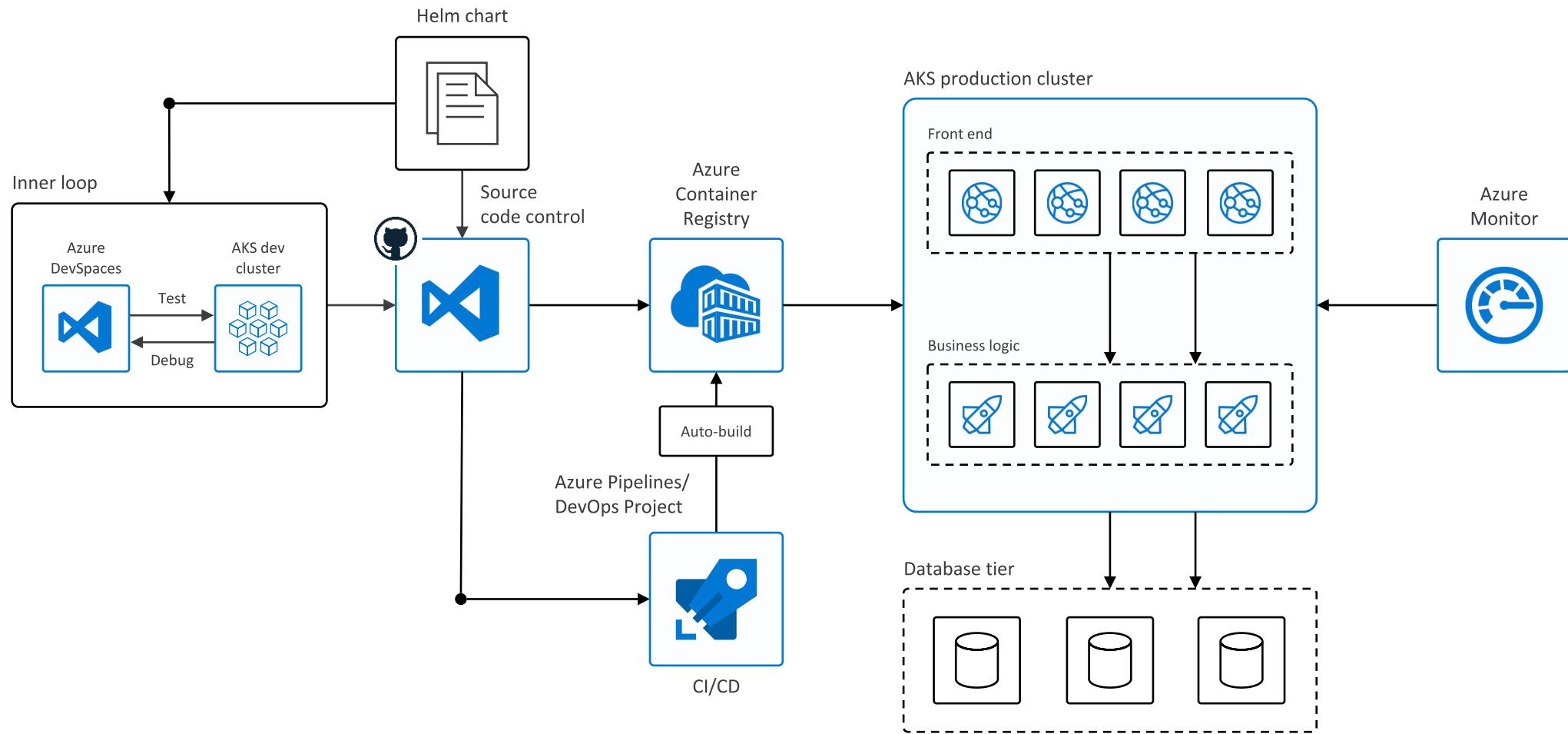
Kubernetes on Azure  
customers grew 5x

# Azure makes Kubernetes easy

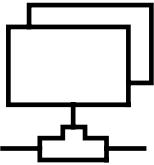
## Deploy and manage Kubernetes with ease

Task	The old way	With Azure
Create a cluster	Provision network and VMs Install dozens of system components including etcd Create and install certificates Register agent nodes with control plane	<a href="#">AZ AKS create</a>
Upgrade a cluster	Upgrade your master nodes Cordon/drain and upgrade worker nodes individually	<a href="#">AZ AKS upgrade</a>
Scale a cluster	Provision new VMs Install system components Register nodes with API server	<a href="#">AZ AKS scale</a>

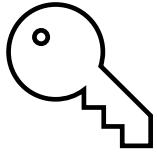
# End-to-end experience



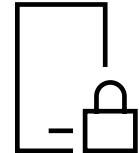
# Secure your Kubernetes environment



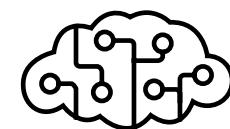
Control access through  
AAD and RBAC



Safeguard keys and  
secrets with Key Vault



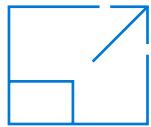
Secure network  
communications with  
VNET and CNI



Compliant Kubernetes  
service with certifications  
covering SOC, HIPAA, and  
PCI



# Scale and run with confidence



Built-in  
auto scaling



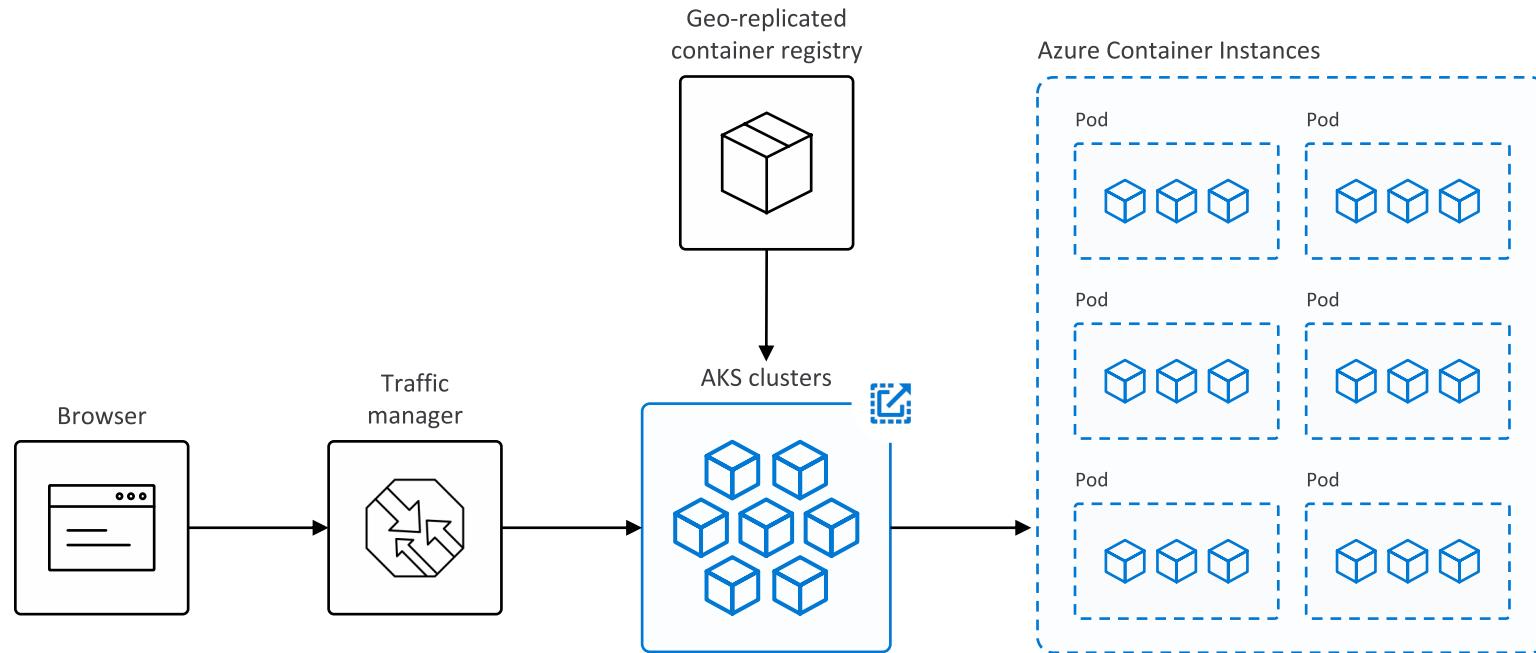
Global  
data center

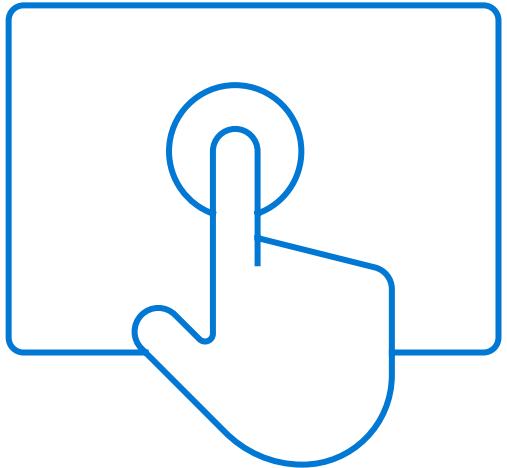


Elastically burst  
using ACI



Geo-replicated  
container registry





## Demo

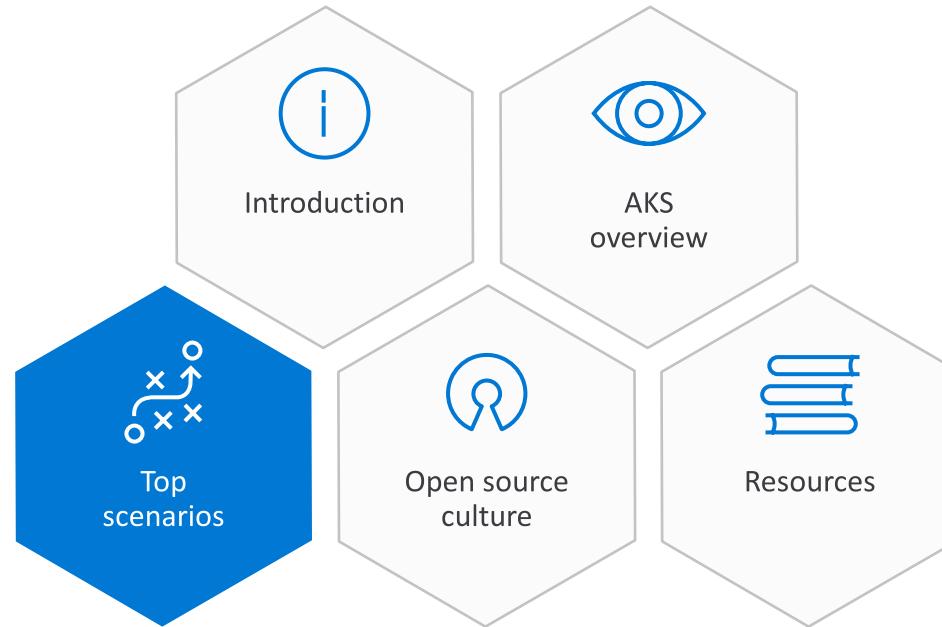
Azure Container Instances

Burst your AKS with Virtual Nodes



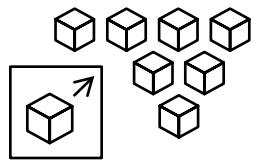
<http://bit.ly/31lYwol>

# Top scenarios



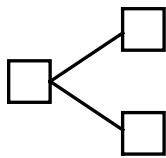
# Top scenarios for Kubernetes on Azure

Lift and shift to  
containers



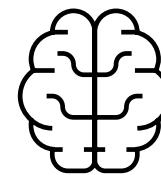
**Cost saving**  
without refactoring  
your app

Microservices



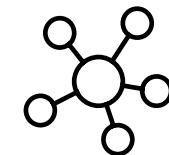
**Agility**  
Faster application  
development

Machine  
learning

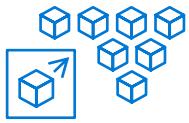


**Performance**  
Low latency  
processing

IoT



**Portability**  
Build once, run  
anywhere



Lift and shift to  
containers



Microservices



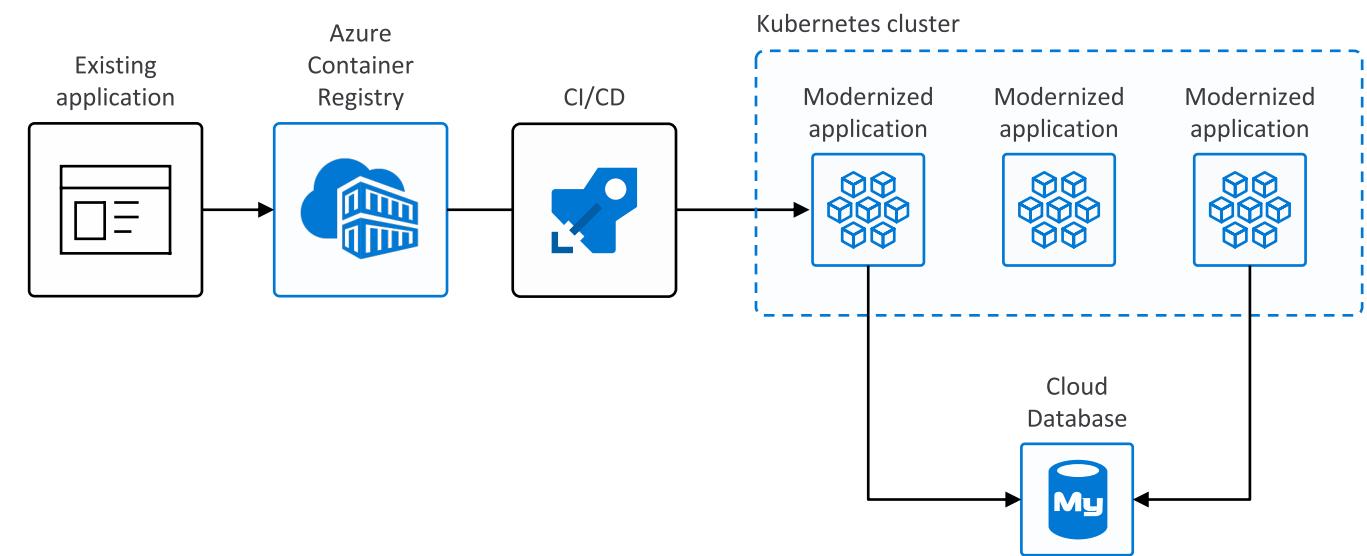
Machine learning



IoT

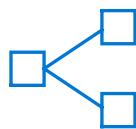
# App modernization without code changes

- Speed application deployments by using container technology
- Defend against infrastructure failures with container orchestration
- Increase agility with continuous integration and continuous delivery





Lift and shift to  
containers



Microservices



Machine learning

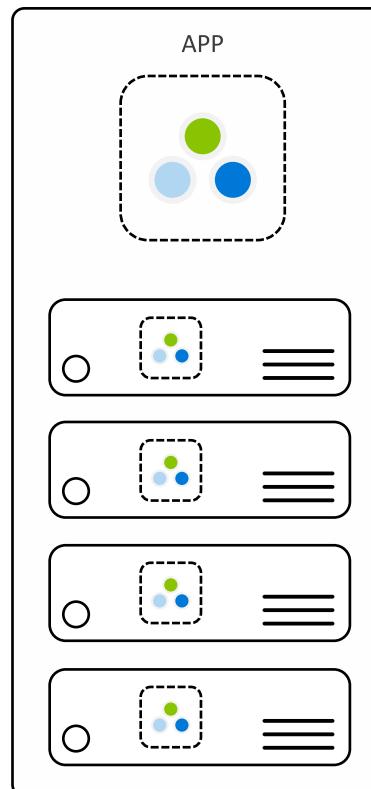


IoT

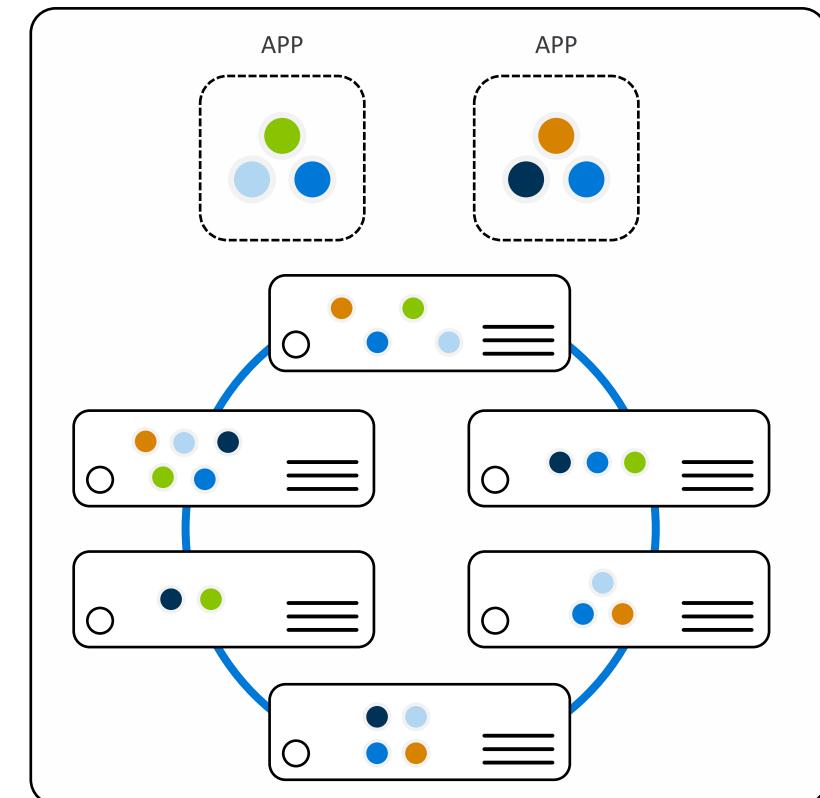
# Microservices: for faster app development

- Independent deployments
- Improved scale and resource utilization per service
- Smaller, focused teams
- **Azure Monitor** provides a single pane of glass for monitoring over app telemetry, cluster-to-container level health analytics.

**Monolithic**  
Large, all-inclusive app

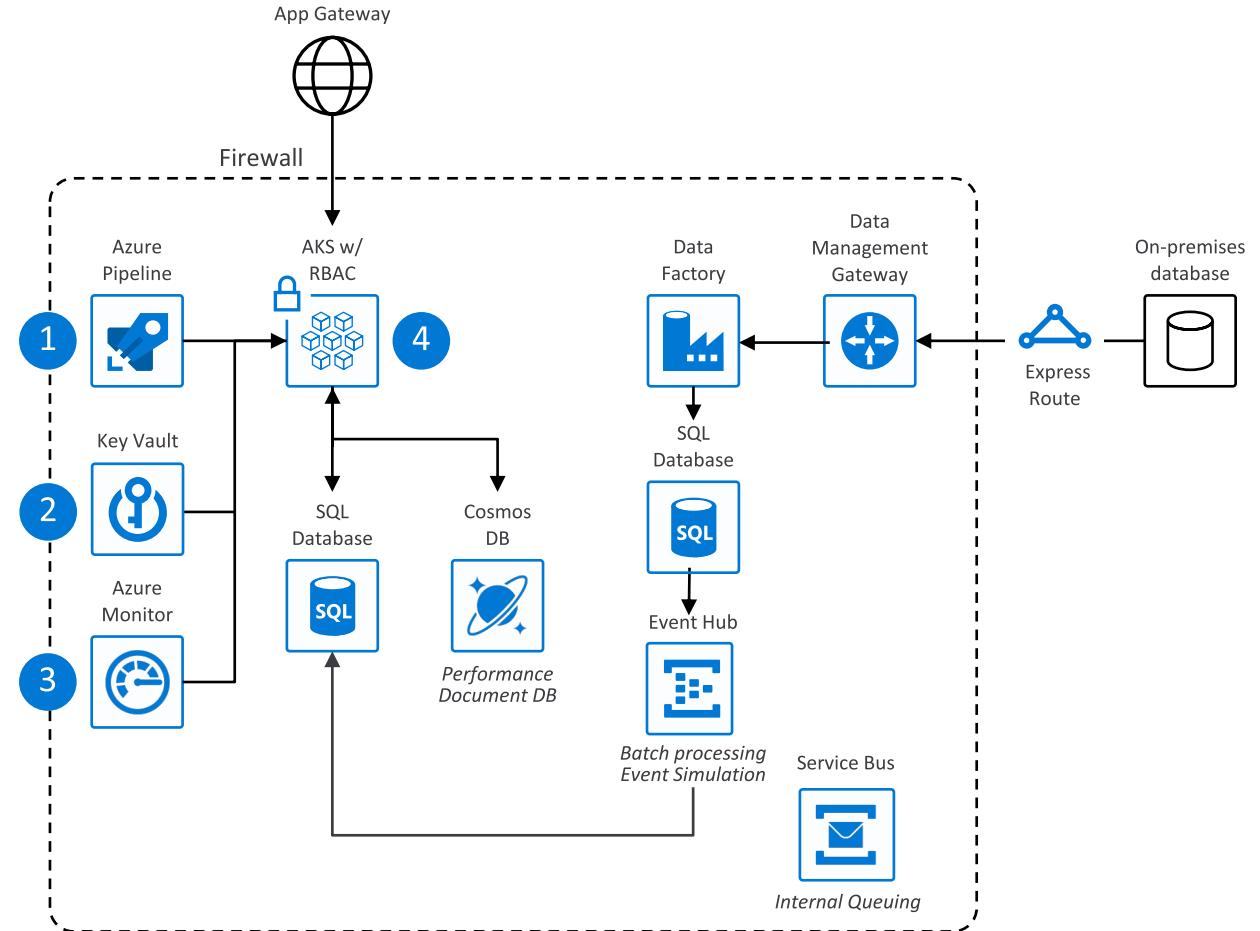


**Microservices**  
Small, independent services



# Architectural approach

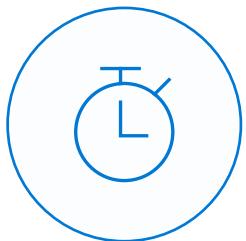
1. Azure Pipelines for automation and CI/CD pipelines; adding Terraform for further automation
2. Key Vault to secure secrets and for persistent configuration store
3. Azure Monitor for containers provides better logging, troubleshooting, with no direct container access
4. RBAC control for fine grained Kubernetes resources access control



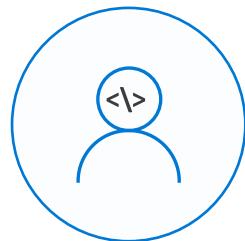
# Results



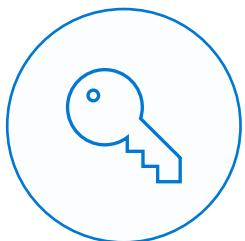
Reduced environment provisioning time from  
**1+** weeks to **2.5** hours



Deploy times reduced to  
minuets with the  
introduction of  
terraform



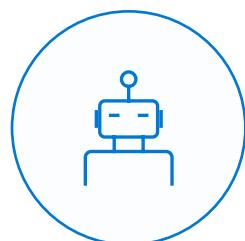
Increased developer  
autonomy with ARM  
and terraform



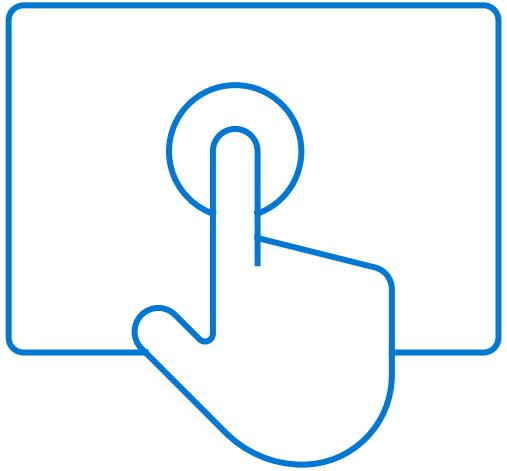
Less time spend on  
managing secrets with  
AKS and Key Vault



AKS and CaaS can  
potentially save **33%** on  
run cost



**100%** automated  
production deployments



## Demo

Microservices with AKS



<http://bit.ly/31lYwol>



Lift and shift to  
containers



Microservices



Machine learning



IoT

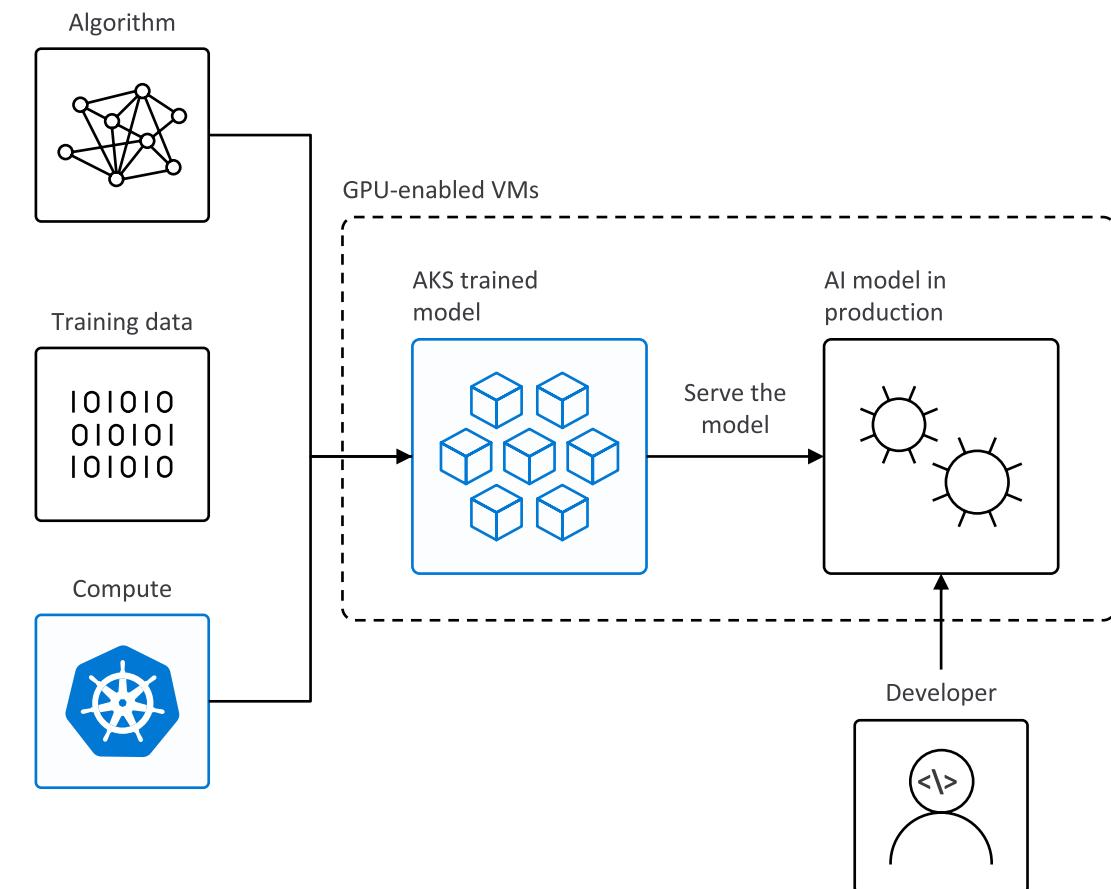
# Data science in a box

- Quick deployment and high availability
- Low latency data processing
- Consistent environment across test, control, and production

<https://github.com/Azure/kubeflow-labs>



Data Scientist





Marketing  
leader Synerise  
depends on  
Microsoft Azure  
to power its  
smart, scalable  
service

## OBJECTIVES

- Combine AI and Open Source to produce next-gen 'marketing cloud'

## TACTICS

- Poland-based innovator opted for BizSpark support to finesse its technology
- Microsoft Azure seen as ideal test bed for Open Source development and integration

## RESULTS

- Platform collects and analyzes every customer interaction and can integrate near limitless data sources
- As an example – one of Synerise customers generated 1,500,000 views of dynamic content daily and subsequently improved its planned program conversion rate by 24%
- Company has won 100+ sales in just two years
- Engine has analyzed more than 4 billion purchase transactions for customers so far
- Can process 100,000 simultaneous data inputs per second



Lift and shift to  
containers



Microservices



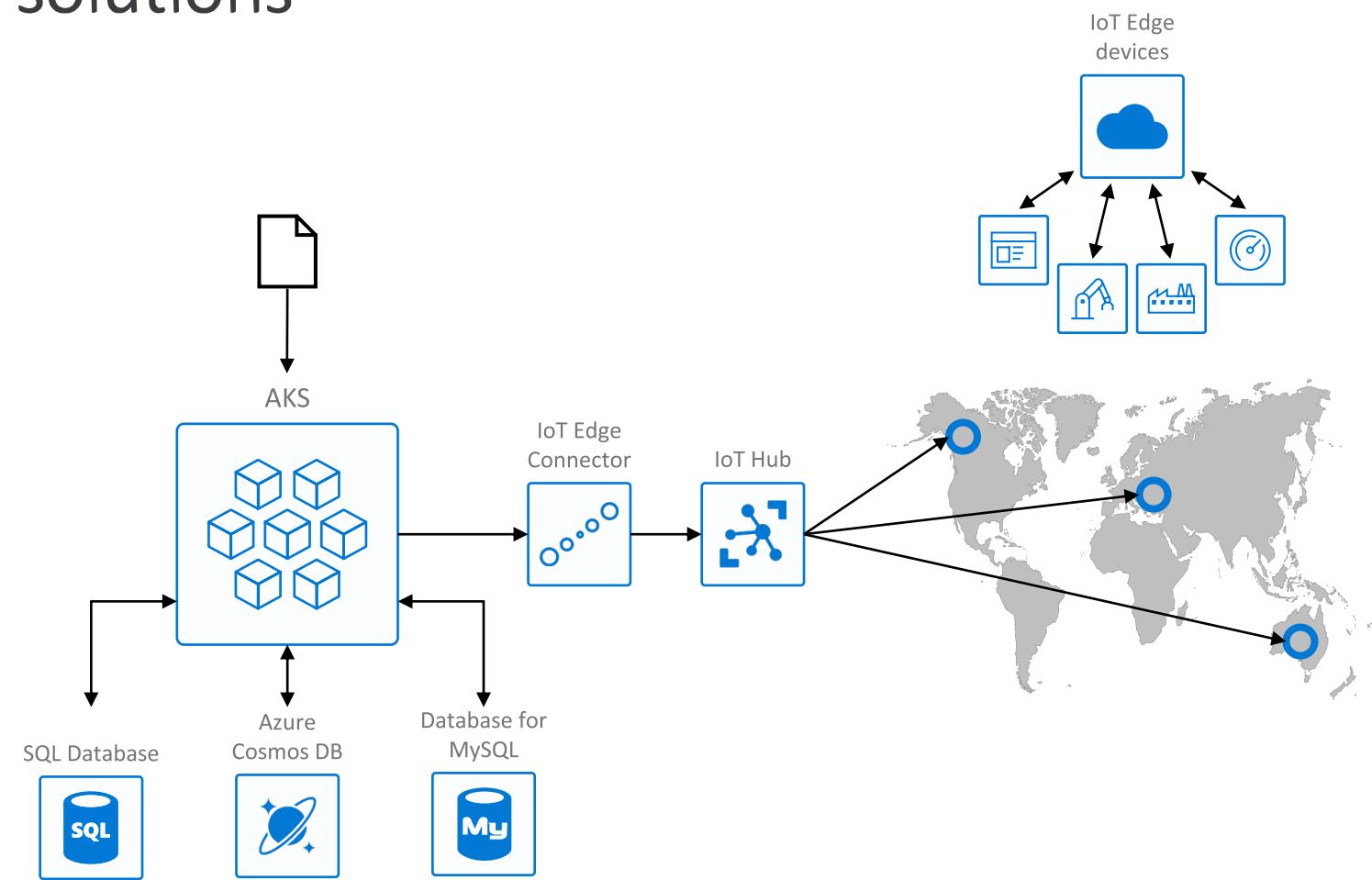
Machine learning



IoT

## Scalable Internet of Things solutions

- Portable code, runs anywhere
- Elastic scalability and manageability
- Quick deployment and high availability





Lift and shift to containers



Microservices



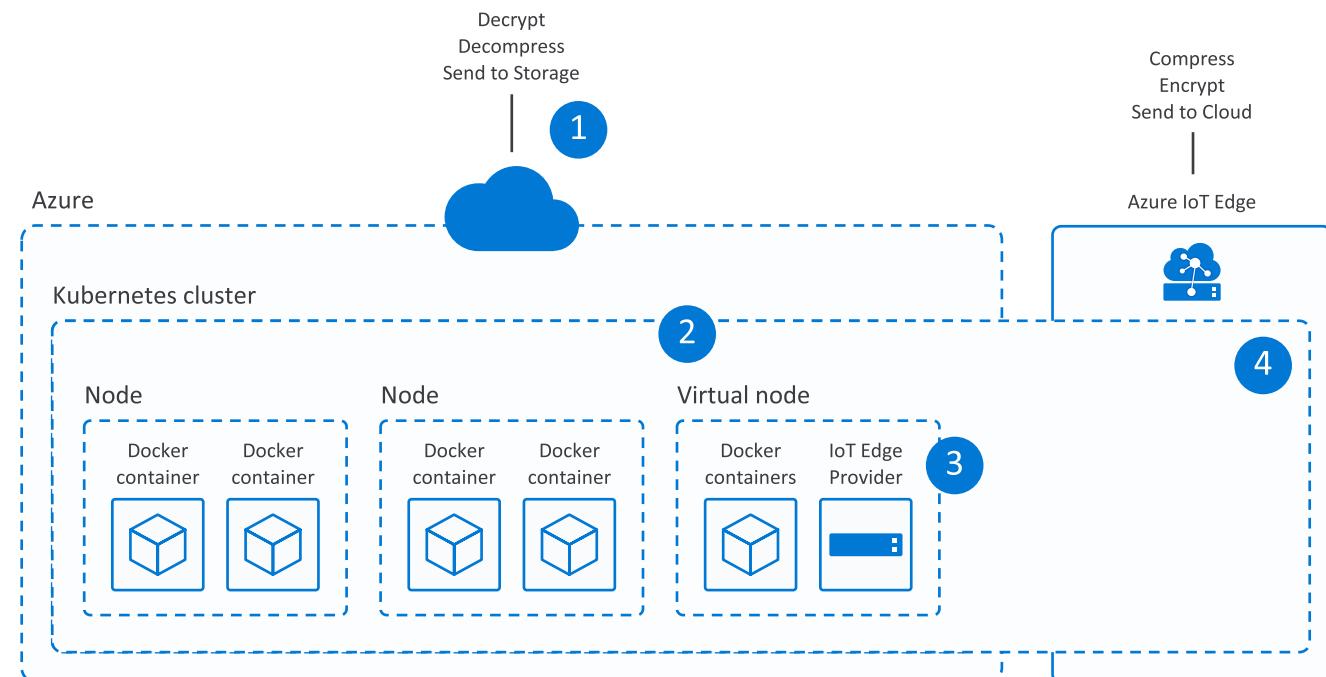
Machine learning



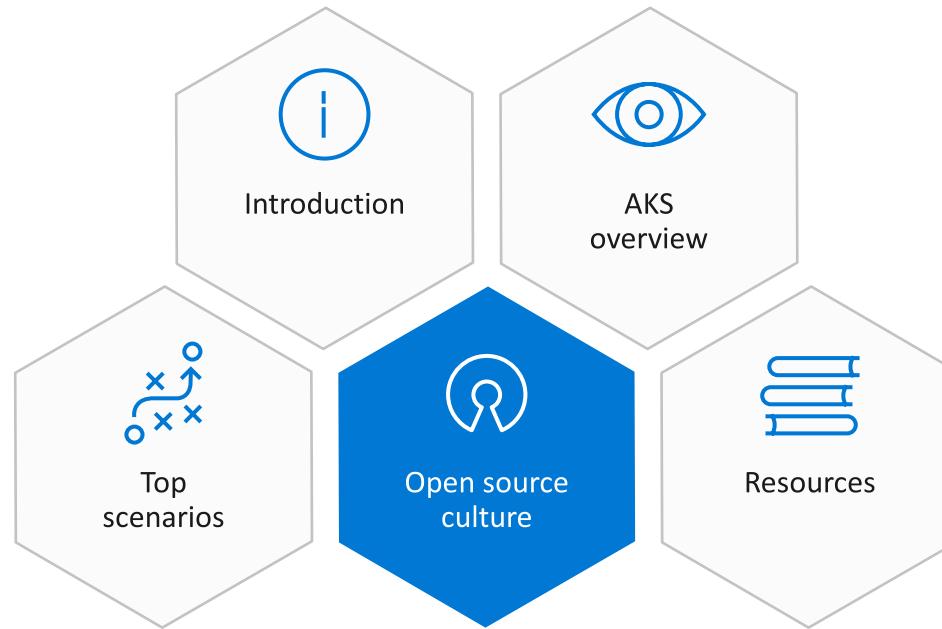
IoT

# Consistent management between cloud and edge

1. Azure IoT Edge encrypts data and send to Azure, which then decrypts the data and send to storage
2. Virtual node, an implementation of Virtual Kubelet, serves as the translator between cloud and edge
3. IoT Edge provider in virtual node redirects containers to IoT Edge and extend AKS cluster to target millions of Edge devices
4. Consistent update, manage, and monitoring as one unit in AKS using single pod definition



# Open source culture



# Work how you want with opensource tools and APIs

	Development	DevOps	Monitoring	Networking	Storage	Security
Take advantage of services and tools in the Kubernetes ecosystem	 	    	     	 	 	   RBAC
...or... Leverage growing Azure support		 Azure DevOps 				 Azure Container Registry  AAD  Key Vault

# Microsoft contributes open source containers



#2 overall individual contributor to Kubernetes



#4 overall individual contributor to Docker

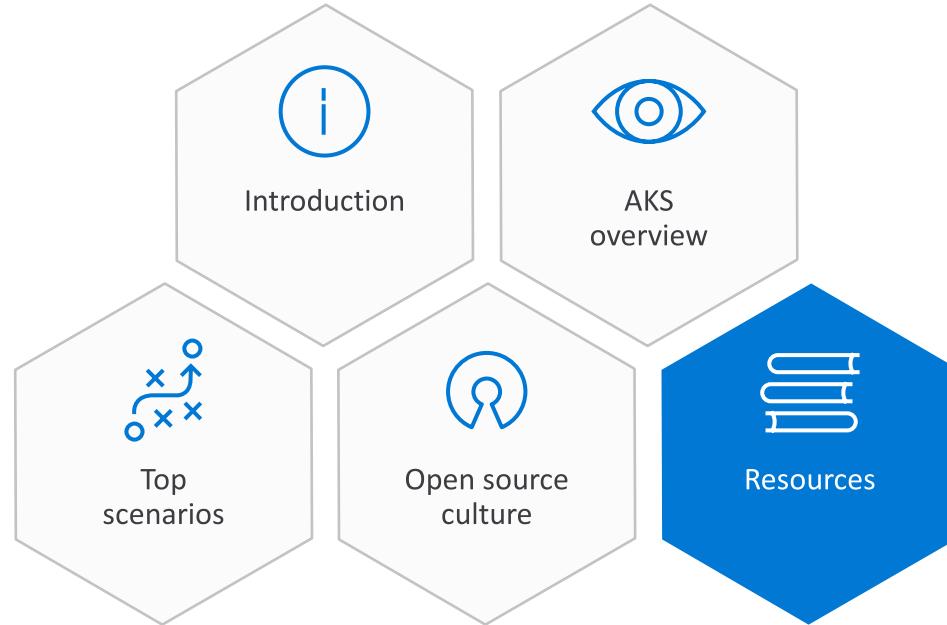


#1–3 overall individual contributors to Helm



70 Microsoft employees have made contributions to Kubernetes

# Resources



# Containers Courses on Microsoft Learn

Docs / Learn / Browse

## Browse learning

Dated: 1/30/2019

Learn new skills and discover the power of Microsoft products with step-by-step guidance. Start your journey today by exploring our learning paths and modules.

**Refine**

Products 

Roles 

Levels 

Types 

containers

3 results found



**Administer containers in Azure**  
1 hr 37 min • Learning Path • 2 Modules

Azure Container Instances are the quickest and easiest way to run containers in Azure. This learning path will teach you how to create and manage your containers, and how ACI can be used to provide elastic scale for Kubernetes.



**Run Docker containers with Azure Container Instances**  
48 min • Module • 7 Units

Learn how to run containerized apps using Docker containers with Azure Container Instances (ACI).



**Build and store container images with Azure Container Registry**  
49 min • Module • 6 Units

Azure Container Registry is a managed Docker registry service based on the open-source Docker Registry 2.0. Container Registry is private, hosted in Azure, and allows you to

<https://docs.microsoft.com/en-us/learn/browse/?term=containers>

Thank you

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Marek Grabarz ([marekgrabarz@outlook.com](mailto:marekgrabarz@outlook.com))