Microsoft

J4K CONFERENCE

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Microsoft

Developing Business Applications with Azure Red Hat OpenShift

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Questions or Comments? Contact Us.

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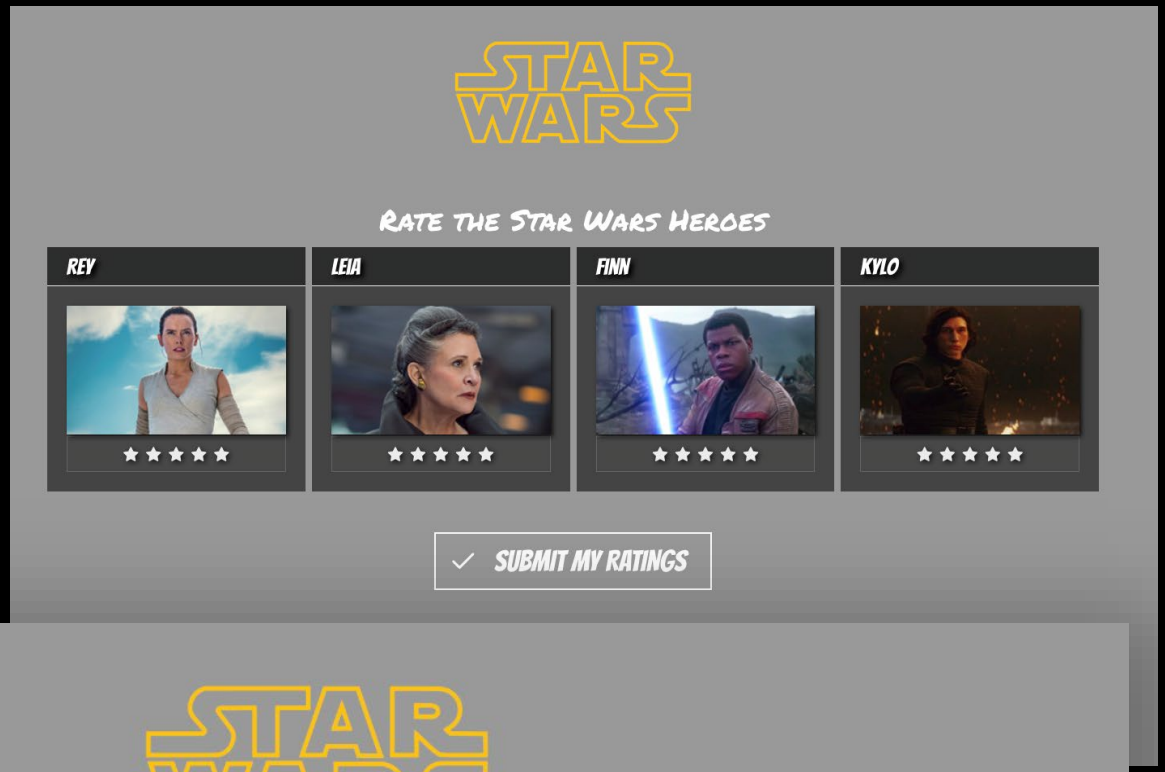
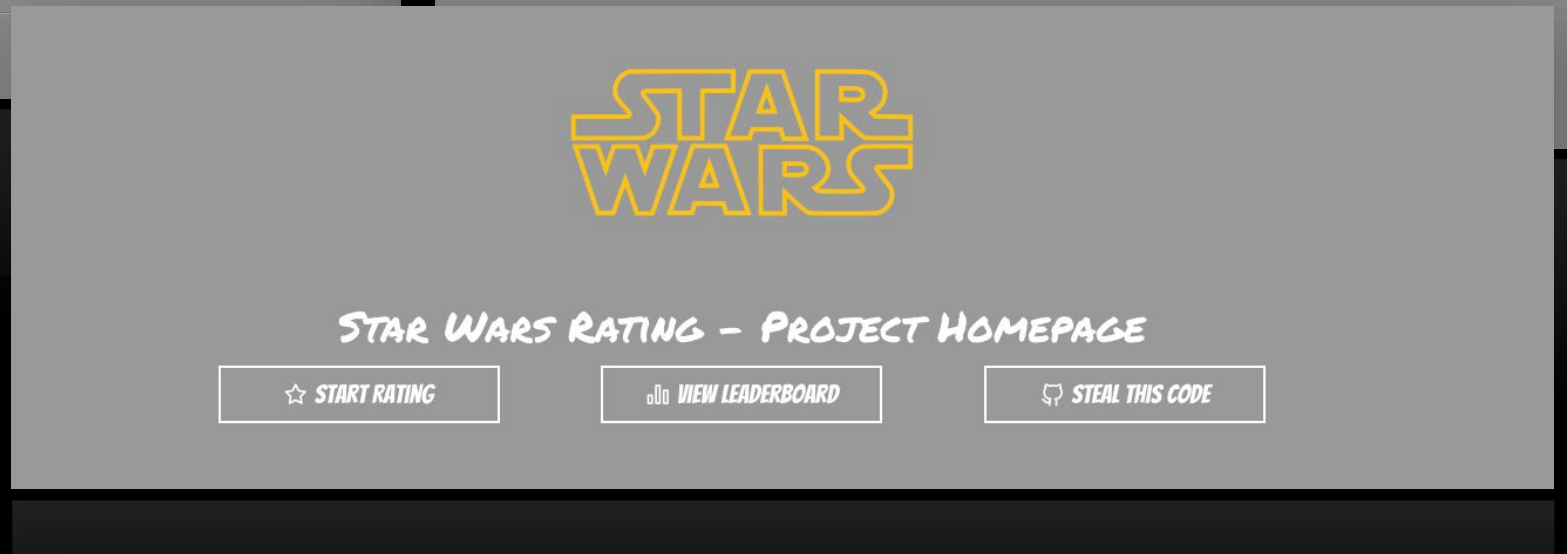
#JavaOnAzure

Vote for your favorite Star Wars heroes now!





https://aka.ms/J4K

Our Plan For Your Time Investment

Word from Brendan Burns

Cloud-native Architecture

- Build, integrate, deploy, manage, scale

DEMO

- Java business app on Azure Red Hat OpenShift

Java and Kubernetes on Azure

- Toolchain & telemetry
- Deployment options
- Migration choices

Resources

Q&A

Brendan Burns on Kubernetes

RIDING THE HAMSTER WHEEL OF PROGRESS

- Kubernetes could be seen as an evolution of the app server.
- How did Kubertenes achieve rapid adoption?

Brendan Burns on Kubernetes

RIDING THE HAMSTER WHEEL OF PROGRESS

Cloud-native Architecture

Cloud-native Architecture on Azure

Cloud-native Architecture

- What do we mean by cloud?
- How is that realized in Azure

Cloud-native Application Lifecycle on Azure

- Build
- Integrate
- Deploy
- Scale

Cloud-Native, but what is Cloud?

- NIST says Cloud Computing is:
  - *On-demand*
  - *Self-service*
  - *Broad network access*
  - *Resource pooling*
  - *Rapid elasticity*
  - *Totally Auditab*le
- https://aka.ms/NISTSays

Cloud-native Java on Azure – Services and Partners

Azure Services


CosmosDB


HPC & Batch


App Service


Container Instances


Container Registry


Kubernetes Service


Serverless Functions


App Insights


VSTS DevOps

SQL Service


Event Grid


Event Hub


Service Bus


Active Directory

Multi-Cloud Platforms

JVMs, Frameworks, Runtimes

Tools

DevOps

IaaS – Linux Distributions

OSS Foundations

Cloud Automation

Kubernetes & Containers

Microsoft SDKs for Java Over 50+ services

Demo

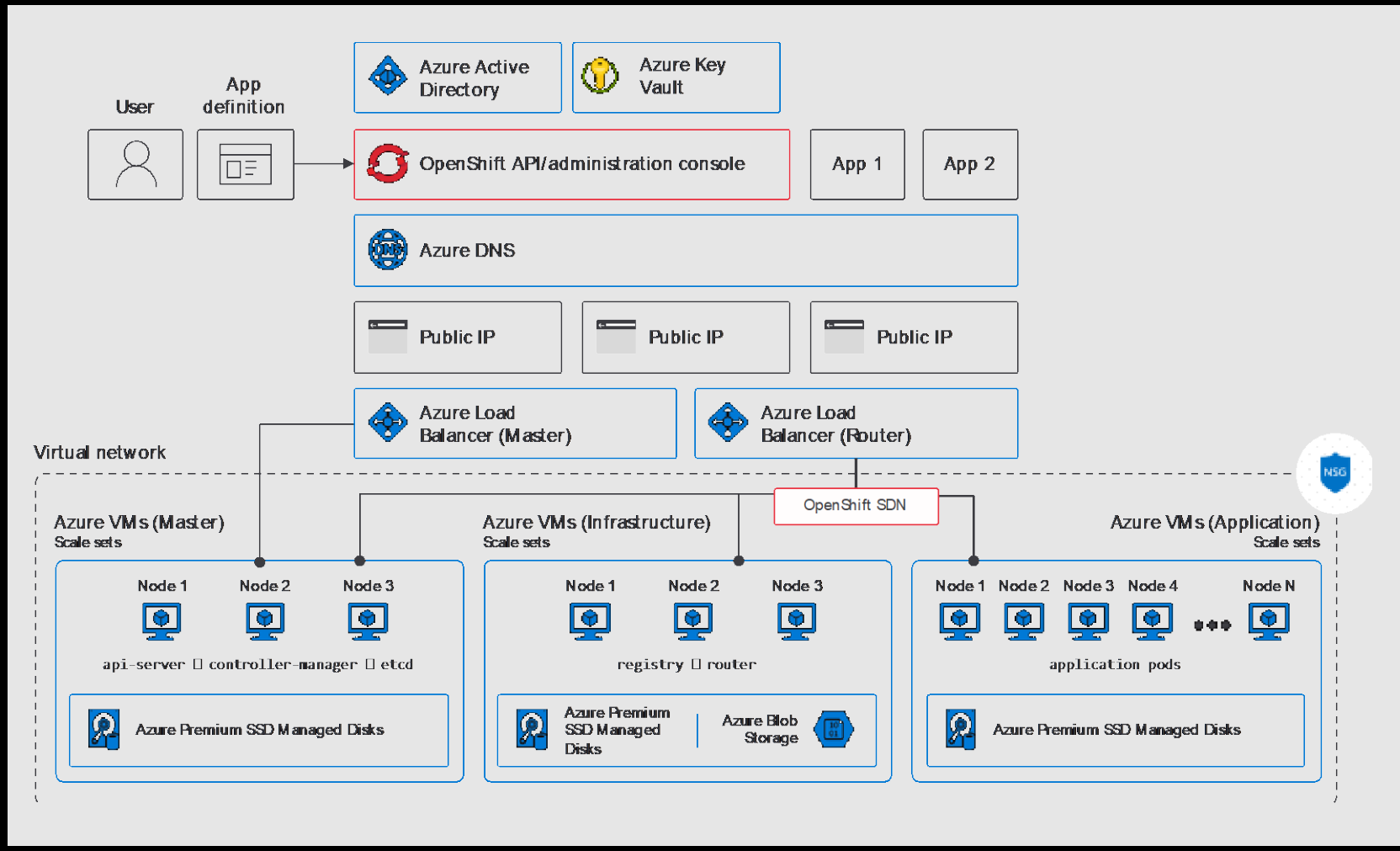
Java business app on Azure Red Hat OpenShift

Joey Schluchter

Running your own Red Hat OpenShift cluster

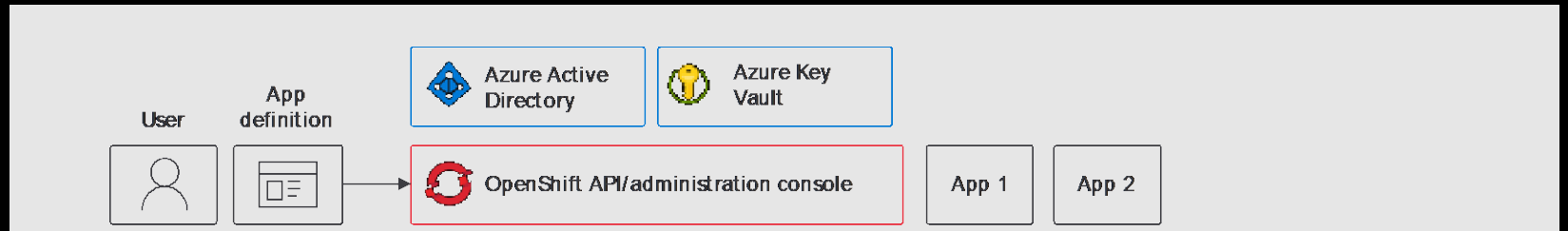
Responsibilities	
User management	
Project and quota management	
Application lifecycle	
Cluster creation	
Cluster management	
Monitoring and logging	
Network configuration	
Software and security updates	
Platform support	

Customer Microsoft and Red Hat



Simplify cluster operations with Azure Red Hat OpenShift

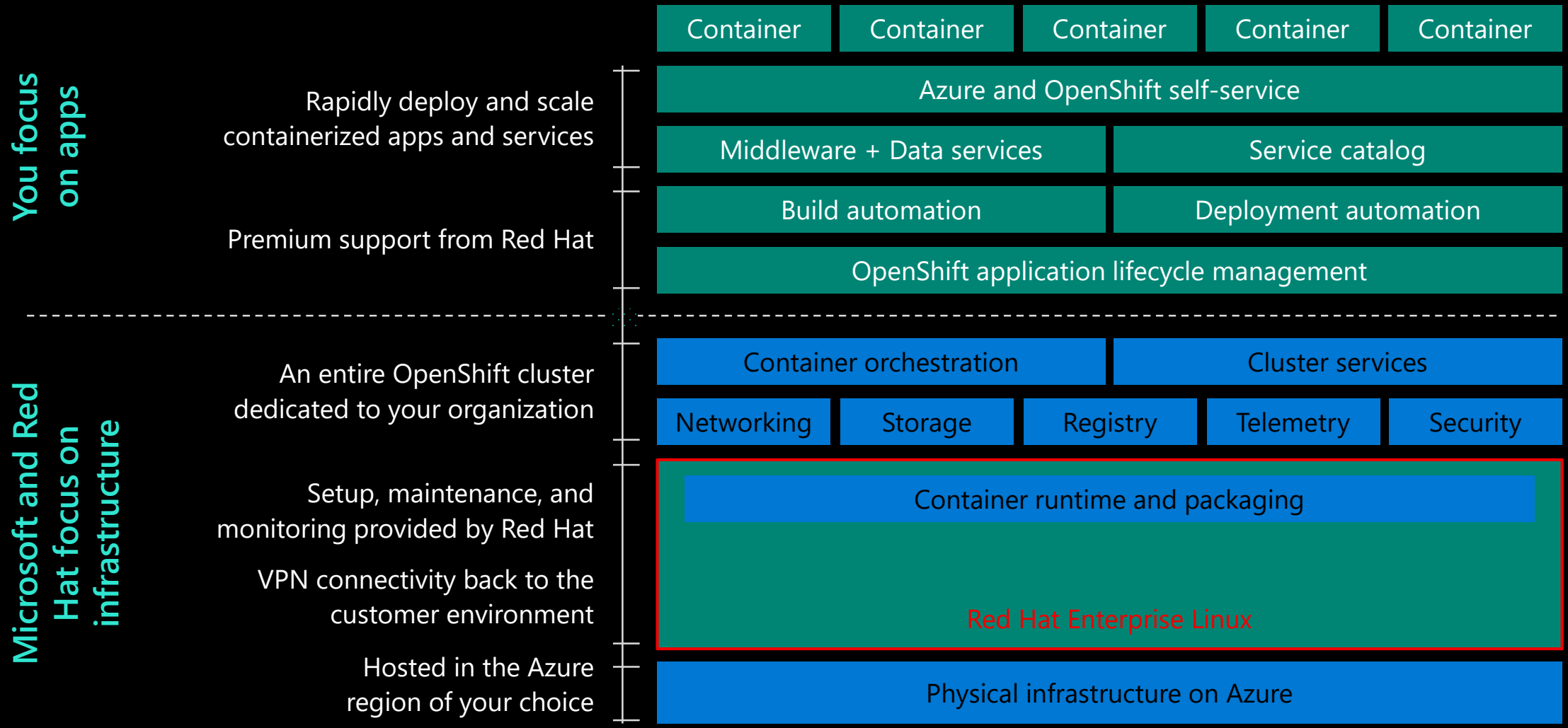
Responsibilities	
User management	Customer
Project and quota management	Customer
Application lifecycle	Customer
Cluster creation	Microsoft and Red Hat
Cluster management	Microsoft and Red Hat
Monitoring and logging	Microsoft and Red Hat
Network configuration	Microsoft and Red Hat
Software and security updates	Microsoft and Red Hat
Platform support	Microsoft and Red Hat



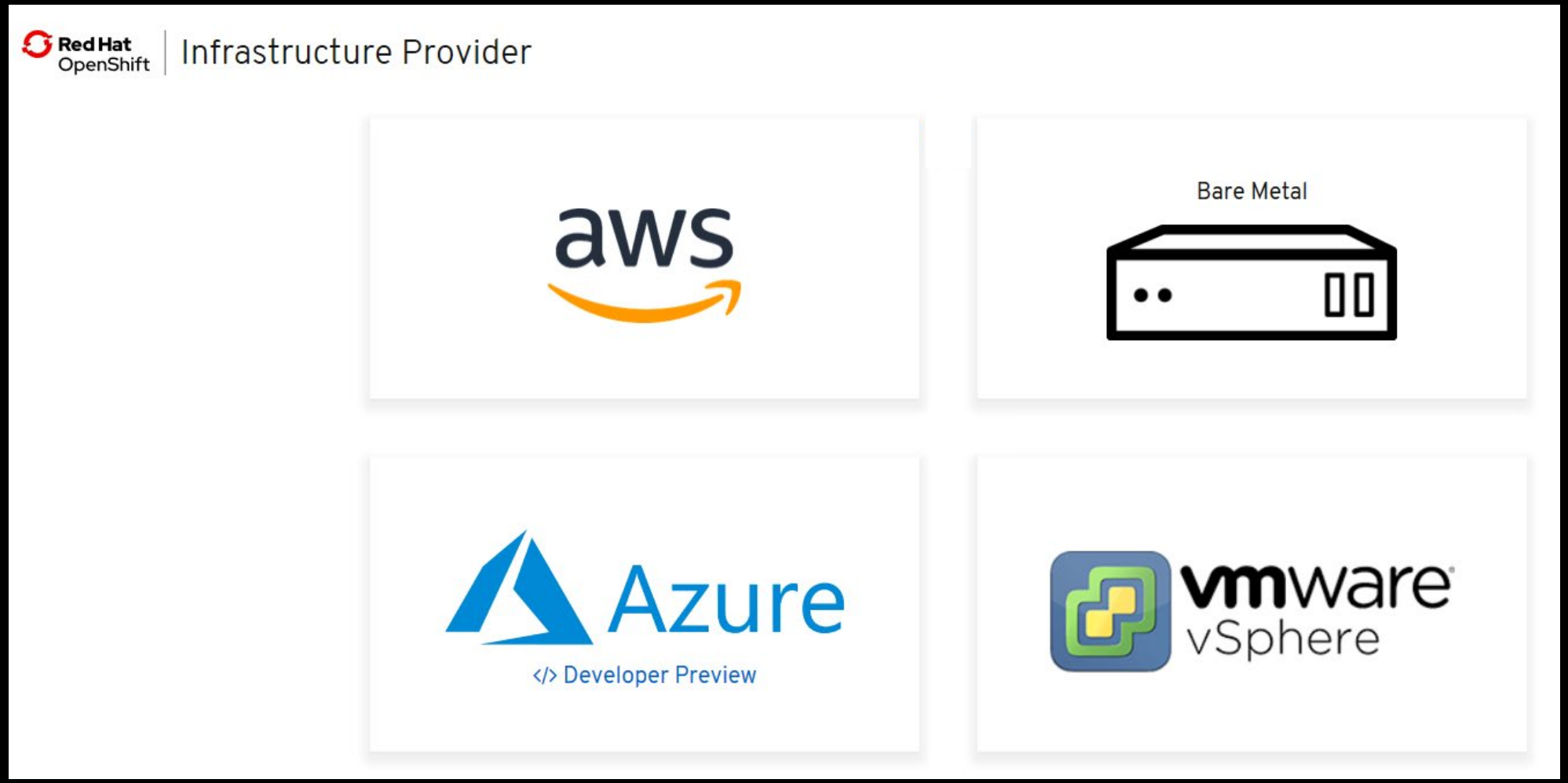
Let Microsoft and Red Hat...

- Manage all your clusters
- Monitor and operate your VMs
- Secure your nodes
- Manage environment patches

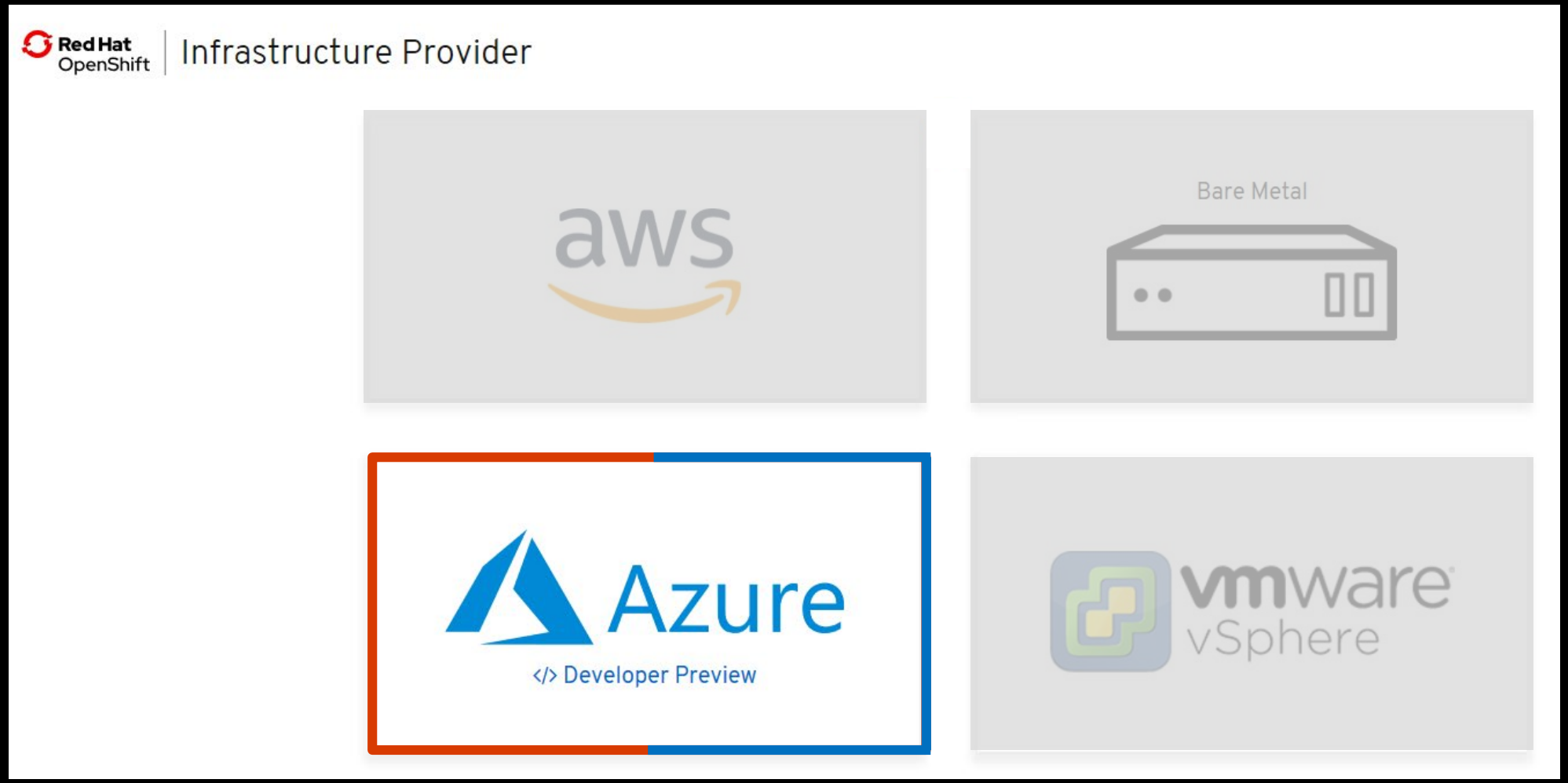
Simplify cluster operations with Azure Red Hat OpenShift



Simplify cluster operations with Red Hat OpenShift



Simplify cluster operations with Azure Red Hat OpenShift



Azure Red Hat OpenShift features

Flexible, self-service deployment
Create fully managed OpenShift clusters in minutes

Cluster node scaling
Easily add or remove compute nodes to match resource demand

Azure Active Directory integration
Use Azure Active Directory to control access to your cluster with an integrated sign-on experience

Fully managed clusters
Master, infrastructure, and application nodes are managed by Microsoft and Red Hat; plus, no VMs to operate and no patching required

Virtual Network integration
Deploy your cluster into a new VNet, then use VNet peering to connect to your existing VNet and on-premises networks

High availability
Multiple masters and infrastructure nodes help ensure your cluster has no single point of failure

First party Azure service
Clusters are deployed into your Azure subscription and included on your Azure bill

Persistent storage volumes
Azure Disk is pre-configured as the default storage class, providing dynamically provisioned Premium SSD's on-demand

Unified support
Jointly engineered, operated, and supported by Microsoft and Red Hat with an integrated support experience

OpenShift Options

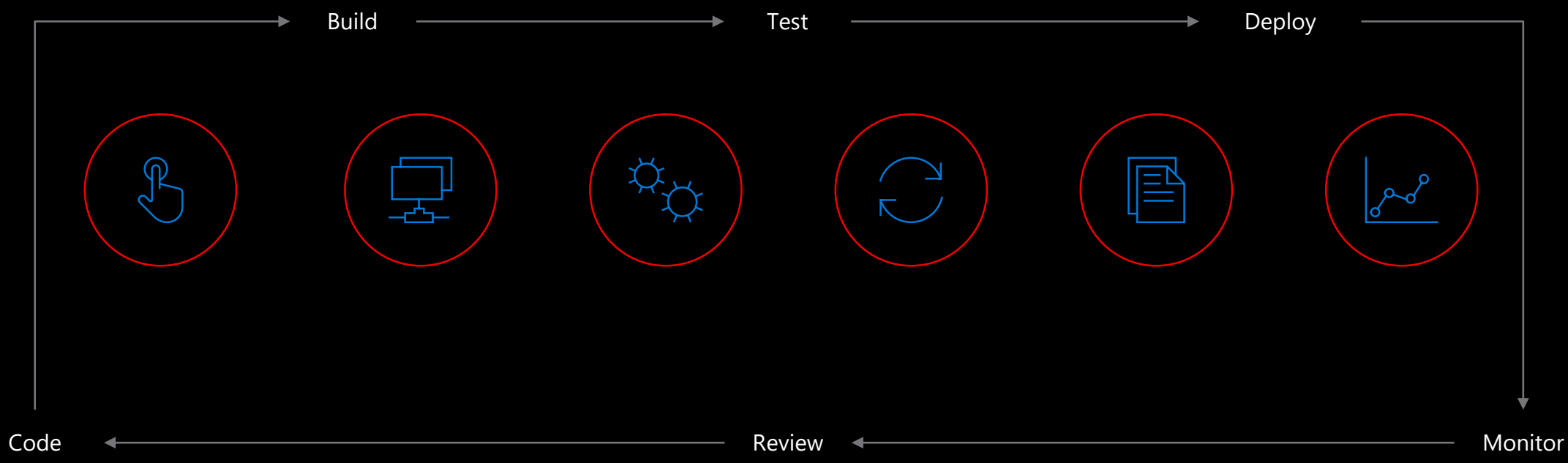
Responsibilities	Azure Red Hat OpenShift (ARO)	Red Hat OpenShift Cloud Platform (OCP)	Red Hat OpenShift Dedicated (OSD)
Cloud Provider	AZURE	AGNOSTIC	AWS
Cloud Integration Points	Web Portal, CLI	Web Portal	?
Self-service	Create, delete, scale, upgrade	Create, delete, scale, upgrade	?
Compute optimization options	General purpose, high-memory, high-compute	User defined	?
Virtual Network Configure	CIDR, Peering	User defined	CIDR, Peering, VPN, Direct Connect
User management	Customer	Customer	Customer
Project and quota management	Microsoft and Red Hat	Customer	Customer
Application lifecycle	Microsoft and Red Hat	Customer	Customer
Network configuration	Microsoft and Red Hat	Customer	Customer
Cluster management	Microsoft and Red Hat	Customer	Red Hat
Cluster creation	Microsoft and Red Hat	Customer	Red Hat
Monitoring and logging	Microsoft and Red Hat	Customer	Red Hat
Platform support	Microsoft and Red Hat	Microsoft and Red Hat	Red Hat
Software and security updates	Microsoft and Red Hat	Red Hat	Red Hat

Customer

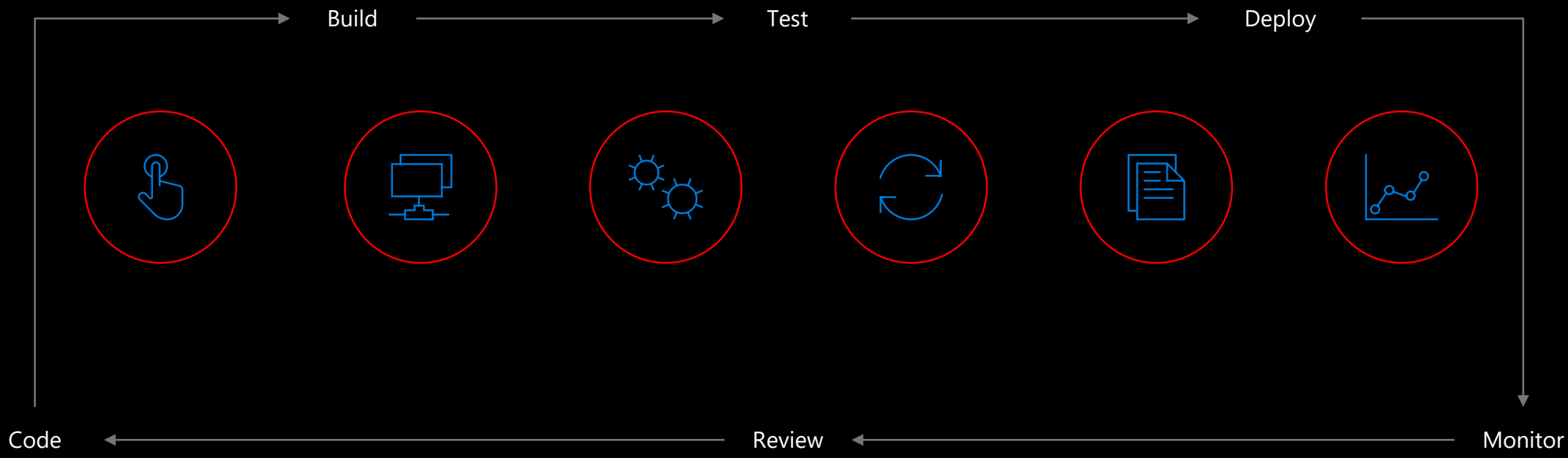
Microsoft and Red Hat

Red Hat

Made for developer productivity



Made for heterogeneity

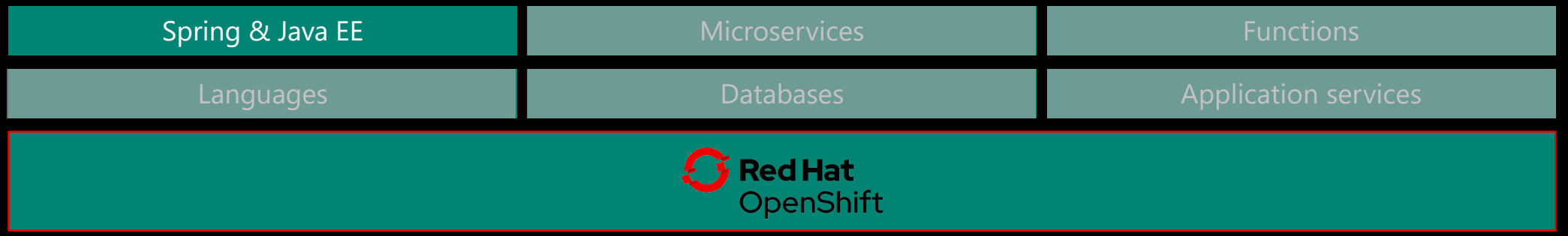


Spring & Java EE | Microservices | Functions

Languages | Databases | Application services

Red Hat OpenShift

Enterprise Java in the Context of OpenShift



Need to ensure concerns that are handled in Java-native way are mapped to the Cloud-native way

- Resource-based scale-up/scale down
  - CPU
  - Memory
  - Throughput
- Health checks
- High availability
- Mutability of the model tier
- Transactional

Java and Kubernetes on Azure

Cloud-native Architecture on Azure

Cloud-native Architecture

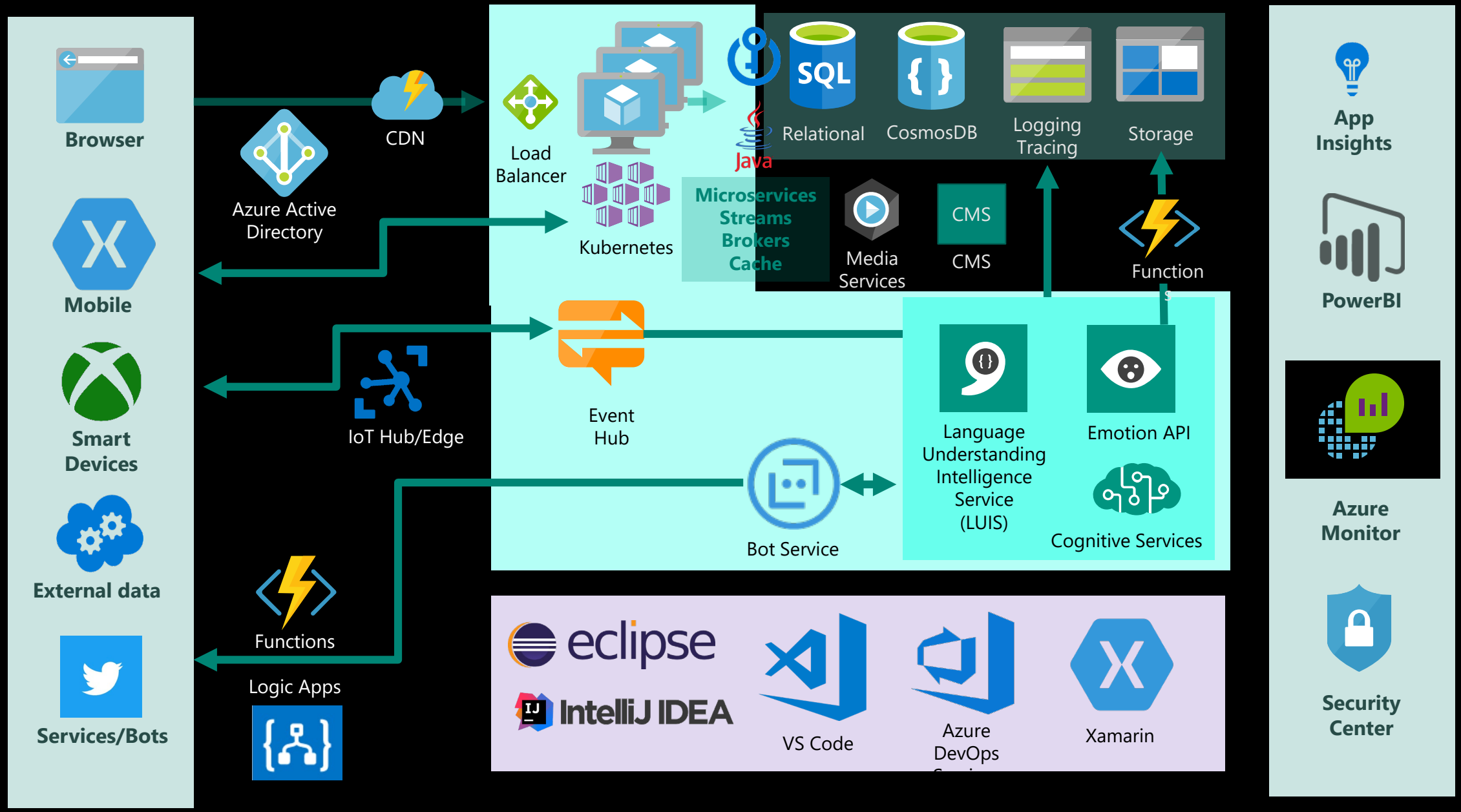
- What do we mean by cloud?
- How is that realized in Azure

Cloud-native Application Lifecycle on Azure

- Build
- Integrate
- Deploy
- Scale

Build

Azure Cloud Native Architecture – Big Picture



Cloud Native Application Lifecycle on Azure

Security: AAD, Key Vault, Graph API, Federation

Build

Frameworks, tools and partners to help you easily build, test and Iterate.

Integrate

Container-ready application platforms
+
Azure's native partitioning, capacity management and HA
+
Data services that handle all common Java app scenarios

Deploy

Azure DevOps
+
Partnerships with major DevOps, CI/CD and Infra tools

Manage + Scale

Azure and Partner solutions for performance and reliability challenges of Modern Java Apps
+
Telemetry with Azure Application Insights and major analytics partners

OPEN SOURCE ECOSYSTEM

THE LINUX FOUNDATION · CLOUD FOUNDRY FOUNDATION · OPEN Compute Project · OPEN CONTAINER INITIATIVE · eclipse · CORE INFRASTRUCTURE INITIATIVE · OPEN SERVICE BROKER API

1st Class Java Tooling Support – Development & CI/CD

Extensions by Microsoft, Partners, and 3rd parties for Java

Visual Studio Code – Extensions

By Microsoft

- Debugger for Java
- Remote Function Debug
- Java Extension Pack
- Apache Maven
- Test Runner (JUnit)
- Spring Initializr
- Azure Terraform

By Partners

- Red Hat: Java Language Support
- Pivotal: Spring, Cloud Foundry, Bosh

Azure DevOps Services Extensions

By Microsoft

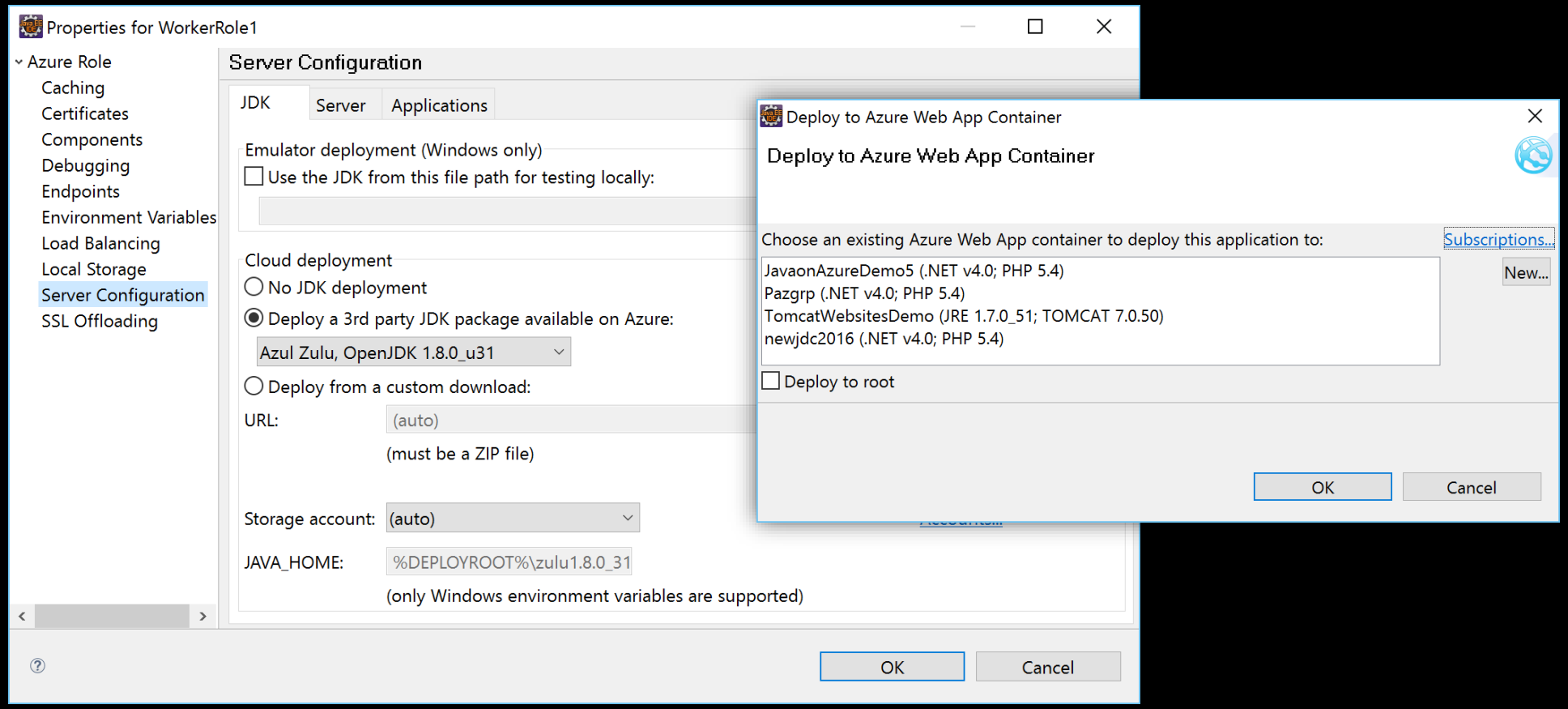
- Jenkins Integration
- GitHub Integration
- Apache Tomcat
- Ansible

By Partners and 3rd party

- CloudBees: Jenkins Platform
- JFrog: Artifactory

Azure Toolkit for Eclipse and IntelliJ

Deploy to Azure Web App Containers



1st Class Support for Java + Kubernetes

Native and idiomatic support for Java applications

Azure Red Hat OpenShift

- Fully managed OpenShift Service
- No VM operation or patching
- Supports JBoss EAP (coming soon)
- Integrated support by Microsoft & Red Hat

Azure App Service

- Java SE 8, 11 on Linux & Windows
- Tomcat 8.5, 9.0 on Linux & Windows
- Plugins for Maven, Eclipse, and IntelliJ
- VS Code Extension (Manage)

Azure Functions

- Java SE 8
- Java SDK
- Plugins for Maven, Eclipse, and IntelliJ
- VS Code Extension (manage; local/remote debug)

Azure Application Insights

- Java SDK for user-defined instrumentation
- Java Agents for auto instrumentation
- Eclipse Plugin
- Open Source SDKs

Azure Cosmos DB

- Java SDK for synchronous connections
- Java SDK for asynchronous (reactive) style
- Support for MongoDB/Cassandra APIs
- Open Source SDKs

Azure SDKs for Java

- Management APIs (CRUD Azure services)
- REST-to-Java APIs
- Fluent APIs (idiomatic service features)
- Open Source SDKs
- **Over 50+ services covered**

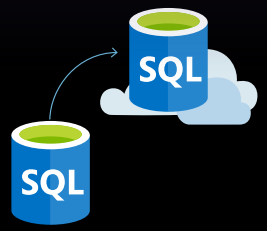
Integrate

SQL Database Support for Java Apps on Azure

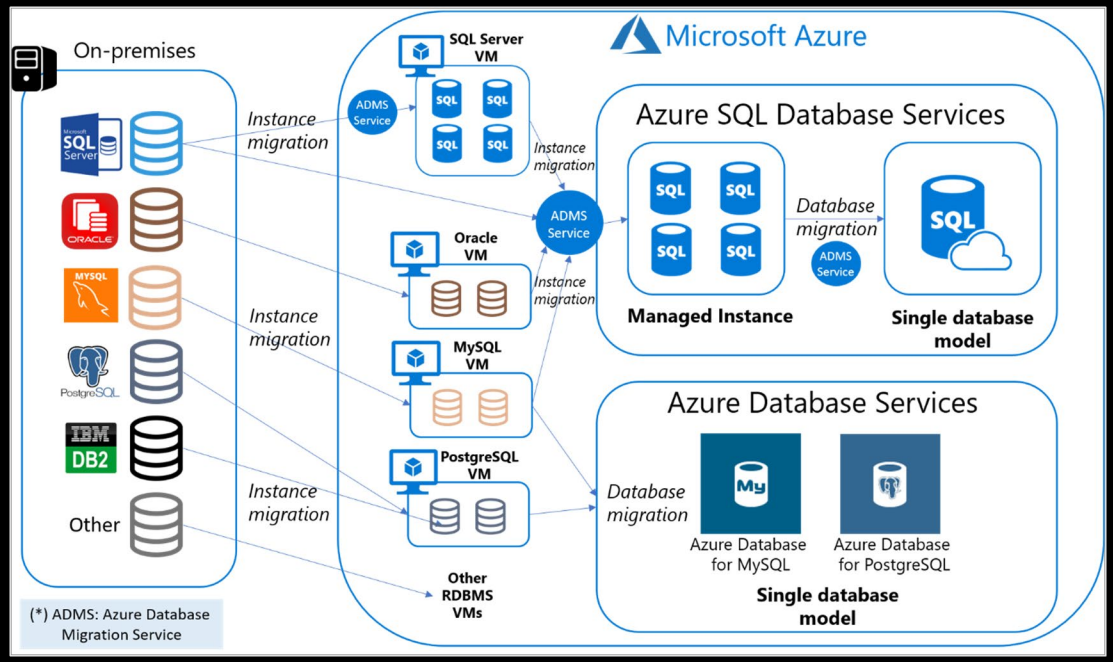
- Azure runs or manages 9 out of the top 10 databases on DB-Engines.com
- And hundreds more through Marketplace and IaaS deployments
- SQL Server's JDBC driver is fully open source

9 of 10
DBs supported/managed on Azure

300+
On Azure Marketplace



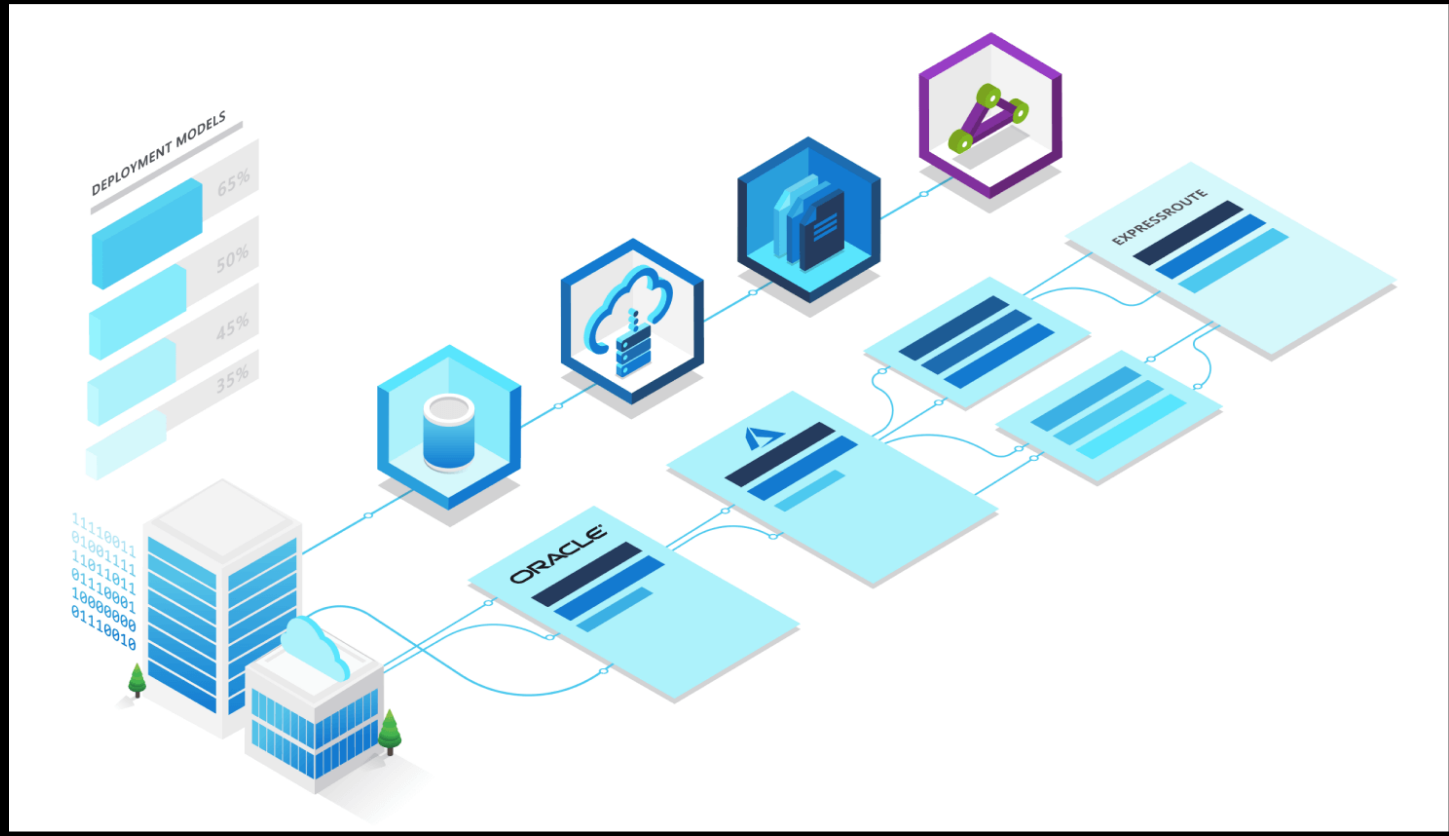
Rank Mar 2018	Rank Feb 2018	Rank Mar 2017	DBMS
1.	1.	1.	Oracle
2.	2.	2.	MySQL
3.	3.	3.	Microsoft SQL Server
4.	4.	4.	PostgreSQL
5.	5.	5.	MongoDB
6.	6.	6.	DB2
7.	7.	7.	Microsoft Access
8.	8.	↑ 10.	Redis
9.	9.	↑ 11.	Elasticsearch
10.	10.	↓ 8.	Cassandra

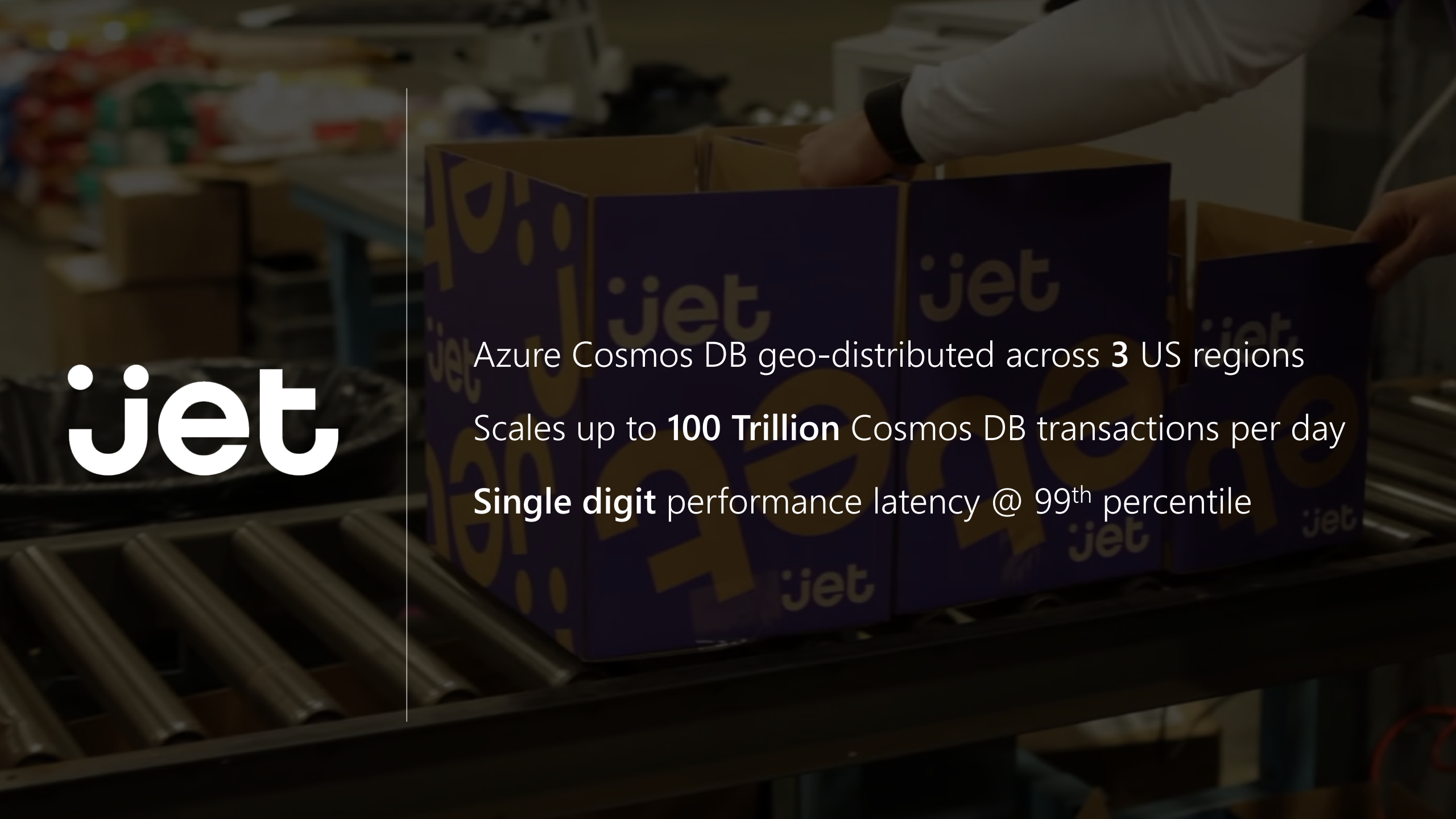


SQL Operations Studio – Lightweight open source tool based on VS Code engine for developing and managing Azure SQL services – others on the roadmap.

Speaking of SQL Database Support on Azure

https://aka.ms/OracleOnAzure





Azure Cosmos DB geo-distributed across **3** US regions

Scales up to **100 Trillion** Cosmos DB transactions per day

Single digit performance latency @ 99th percentile

Azure Cosmos DB for the non-Microsoft world

A globally distributed, massively scalable, multi-model database service

SQL

GA when service was launched

GA when service was launched

mongoDB.

GA – Mar 2017

Table API

GA – Dec 2017

Gremlin

$G = (V, E)$

GA – Dec 2017

cassandra

GA - 2017

APACHE Spark

GA – Nov 2017

APACHE HBASE

ANSI SQL

Column-family

Document

Key-value

Graph

Guaranteed low latency at the 99th percentile

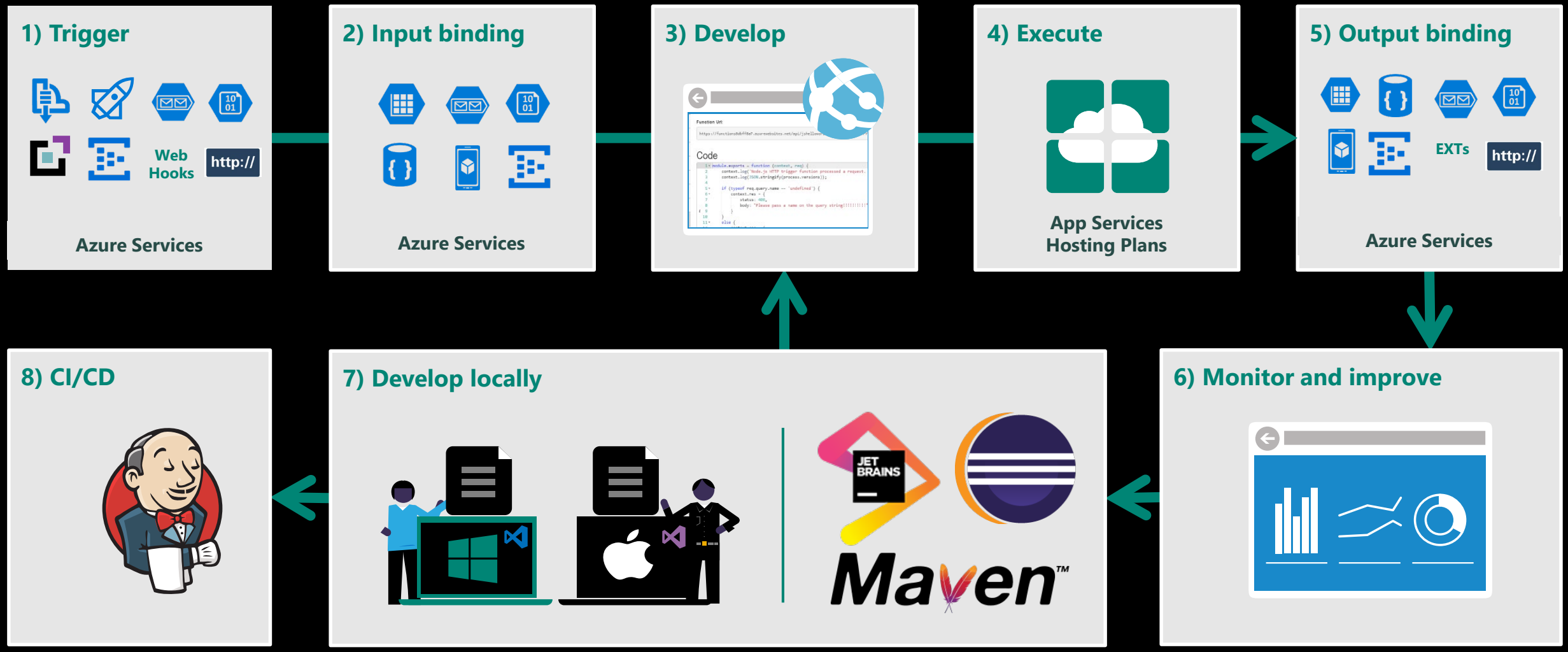
Elastic scale out of storage & throughput

Five well-defined consistency models

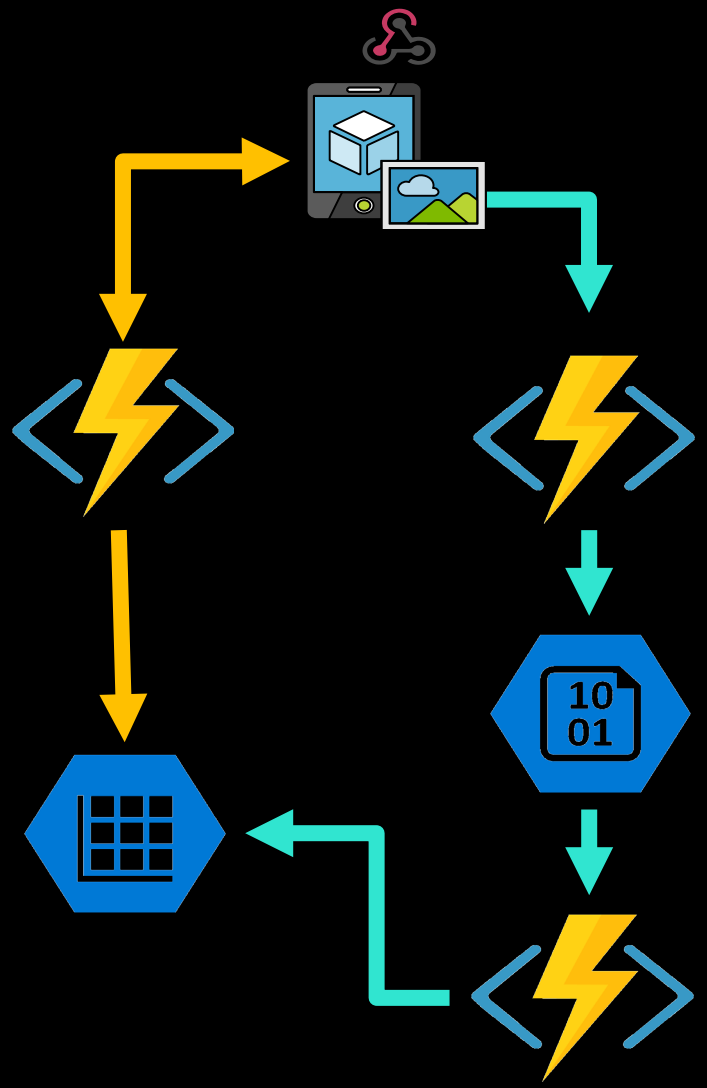
Turnkey global distribution

Comprehensive SLAs

Seamless Dev Experience with Azure Functions



Serverless with Azure Functions



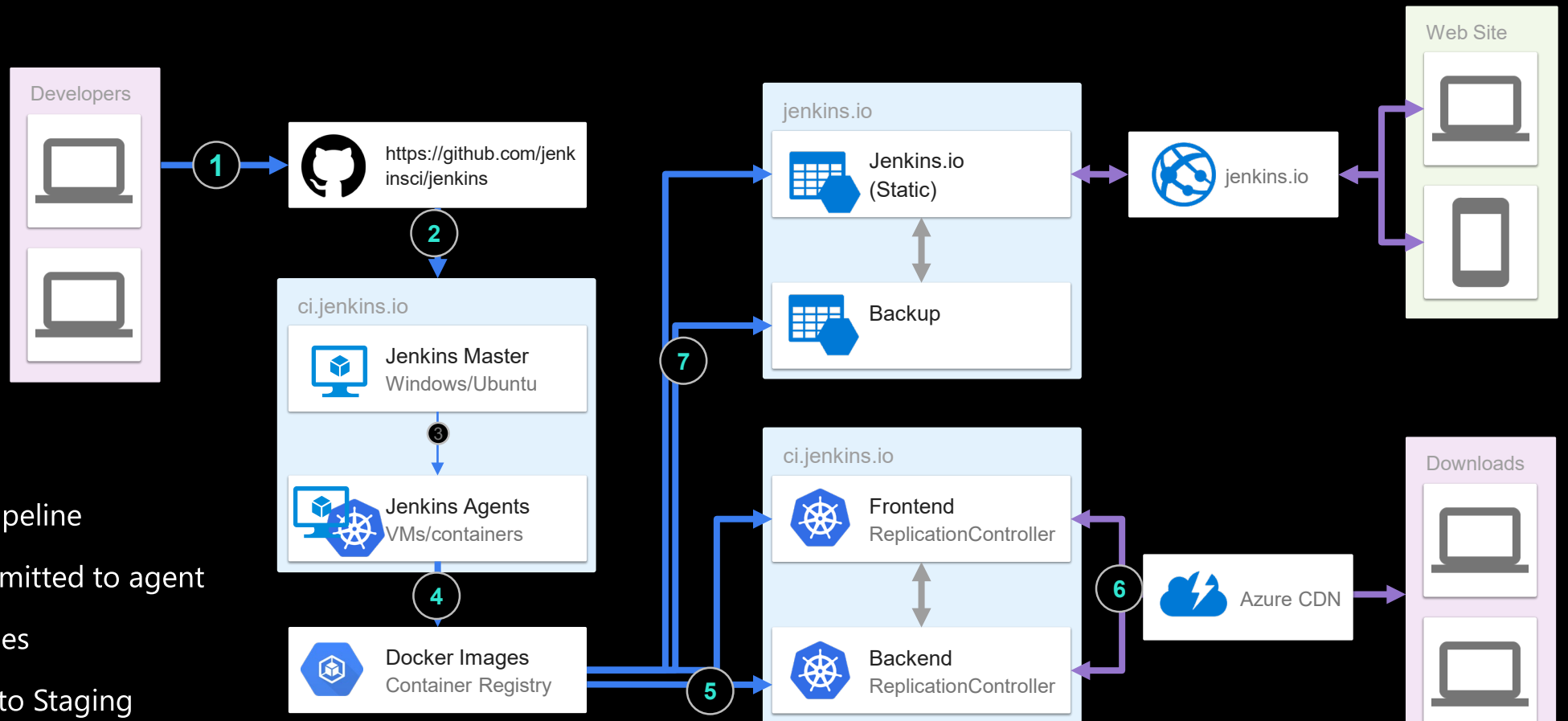
Tasks/ Activities

- Upload photo to storage
- Process thumbnail(s)

Without Azure Functions	Using Azure Functions
Setup a VM / Container / Web App	~~Setup a VM / Container/ Web App~~
Build / patch / deploy	~~Build / patch / deploy~~
Monitor events	~~Monitor events~~
Build Web App	~~Build Web App~~
Use Azure SDK	**Use Azure SDK**
Build async data processing for scale	~~Build async data processing for scale~~

Deploy

Jenkins running on Azure



1. Commit Code
2. Code Enters CD pipeline
3. Test/build job submitted to agent
4. Push Docker images
5. Images deployed to Staging
6. Operational and Functional Testing
7. Images deployed to production

Jenkins Plugin

Jenkins Agent plugin for Azure

- Deploy Azure Agents on AKS and VMs
- Windows or Linux

Azure Artifact delivery plugins

- Easily deploy artifacts to Azure
- Azure Storage plugin for Jenkins
- Azure AKS plugin
- Azure VM plugin
- Azure ACI plugin

Migration Choices

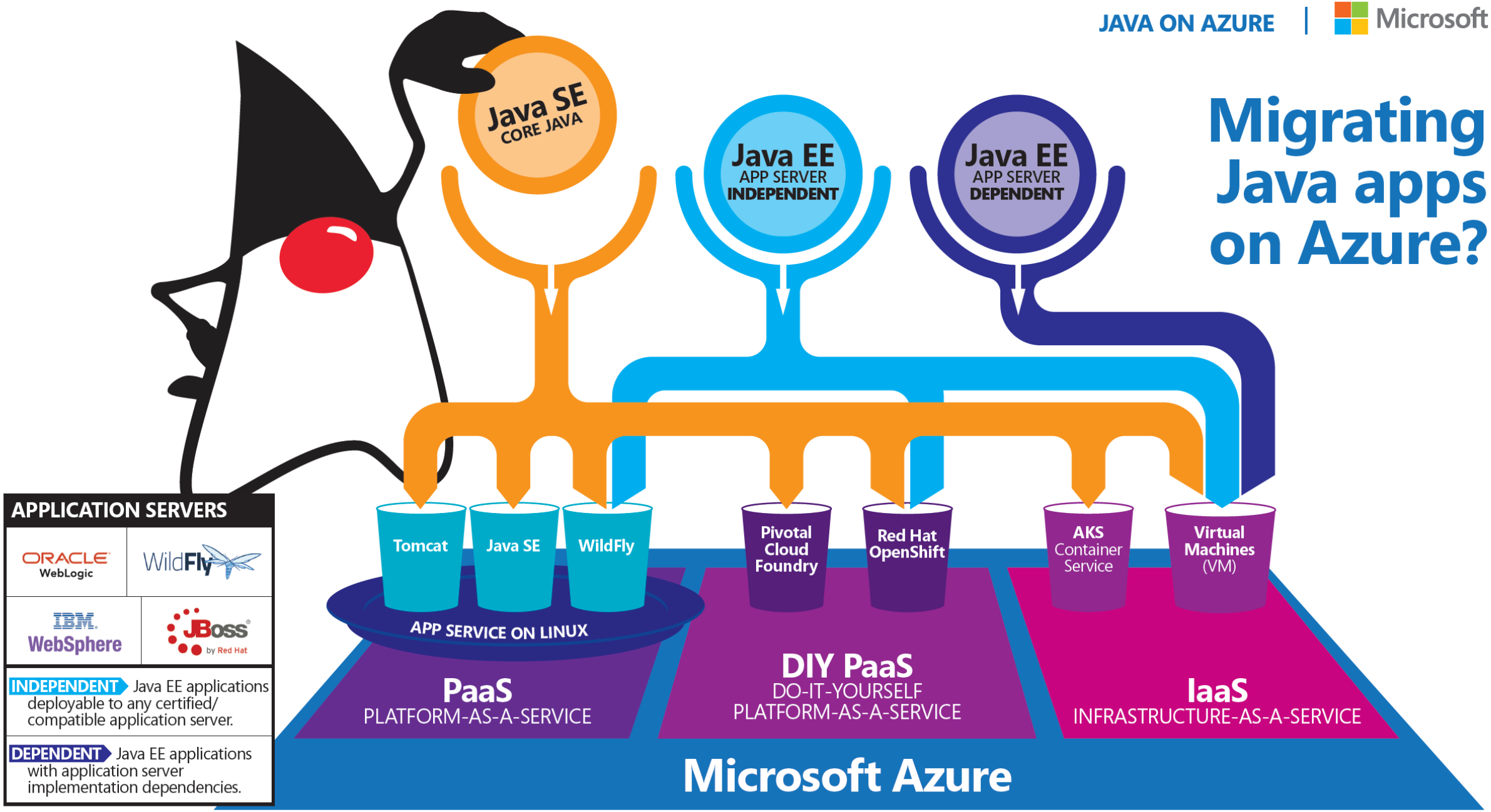
Deployment Choices

Four common use cases seen at customers

	Lift & Shift	Kubernetes & Containers	Cloud-native Platforms	Serverless
Definition	• Traditional VM workloads • Tomcat/Spring web apps • Java EE applications • Relational databases	• Container-based deployments • Use of Netflix OSS and other related tools for service orchestration	• Cloud Foundry • OpenShift • NoSQL databases	• Event-triggered ephemeral functions • PAYG
Partners	Red Hat, Oracle, IBM, Azul Systems, Terraform, CloudBees	Docker, CloudBees, Azul Systems, Red Hat	Pivotal, Red Hat	CloudBees, Pivotal
Common Azure Services	• Azure Migrate Service • Azure VMs, Azure AD • Azure Site Recovery • Azure Database Migration Service • Azure DevTest Labs	• Azure Container Service (AKS) • Azure Container Instances • Azure Container Registry	• Azure VMs • Azure Container Service (AKS) • Azure Storage • Azure AD • Azure CosmosDB	• Azure Functions • Azure Logic Apps • Azure App Insights • Azure CosmosDB
Customer Cases	Stanley Healthcare, RCS Italy, Daimler	JB Hunt	Ford, Manulife, Merrill, Mastercard	*Large restaurant company*

JAVA ON AZURE | Microsoft

Migrating Java apps on Azure?



APPLICATION SERVERS

ORACLE WebLogic | WildFly

IBM WebSphere | JBoss by Red Hat

INDEPENDENT Java EE applications deployable to any certified/ compatible application server.

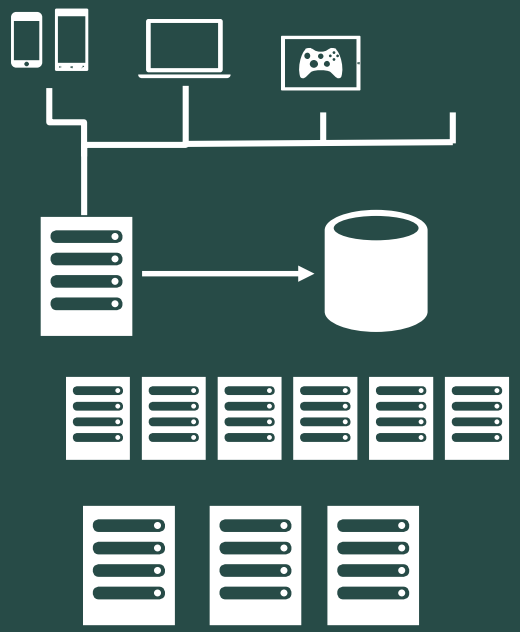
DEPENDENT Java EE applications with application server implementation dependencies.

Application Insights for Java

Visibility, insights, and analytics

- 360^0 view across availability, performance, and usage
- Fast and powerful diagnostics and usage insights
- Built-in analytics for any app

Sources of telemetry



Java

Instrument Java Web apps with Application Insights with no code changes!

Edit ApplicationInsights.xml in the same folder as the SDK

```
<InstrumentationKey>**
Azure instrumentation key
**</InstrumentationKey>
```

Microsoft/ApplicationInsights-java

Scalability

Single Function

Azure Functions

Micro-compute-based FaaS

Infrastructure-free

Supports KEDA scalability

Web App

Azure App Service

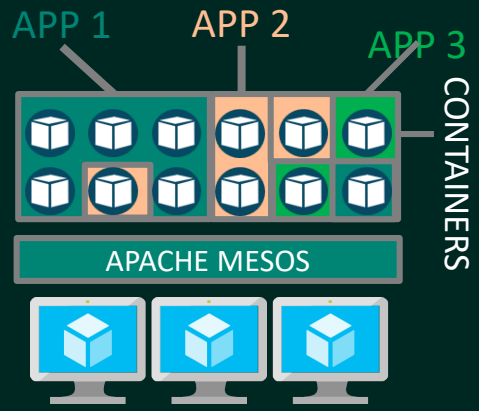
Web-based PaaS

Tomcat on Linux

Java SE on Linux

Scalable via portal and CLI

Containers & K8s



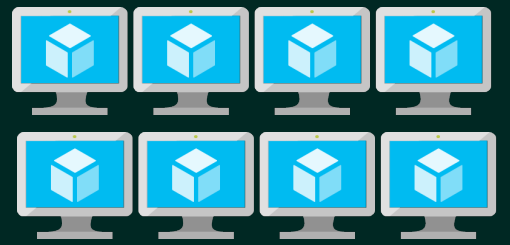
Azure Kubernetes Service (AKS)

Containers-as-a-Service

Container Orchestrator

Scalable w/ Managed parameters

Virtual Machines



Azure Compute

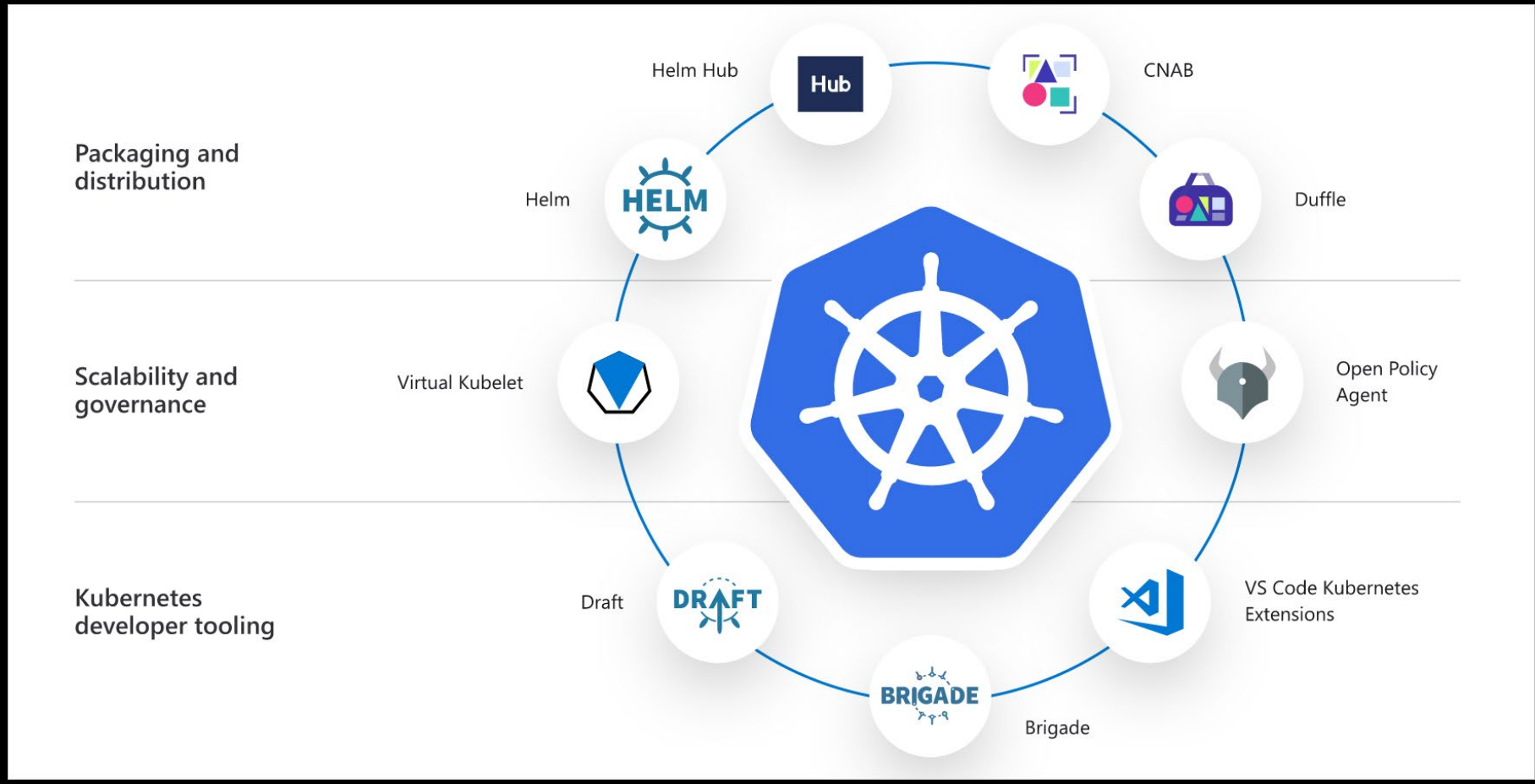
Infrastructure-as-a-Service

AKS-engine

VM Scale Sets

Kubernetes Belongs to the Community

- **30,000 – contributors**
- **150,000 – commits**
- **Top Project in GitHub**



Resources | Q&A

Questions or Comments? Contact Us.

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#JavaOnAzure

More Java Case Studies

https://azure.microsoft.com/case-studies/

Resources

- Java on Azure -- https://azure.microsoft.com/develop/java/
- Java on Azure docs -- https://docs.microsoft.com/azure/java/
- Azure Kubernetes Services (AKS) -- https://azure.microsoft.com/services/kubernetes-service/
- AKS docs -- https://docs.microsoft.com/azure/aks/
- Azure Container Registry -- https://azure.microsoft.com/services/container-registry/
- Azure Container Service -- https://azure.microsoft.com/services/container-instances/
- Azure Red Hat OpenShift-- https://azure.microsoft.com/services/openshift/
- Red Hat OpenShift -- https://www.openshift.com/products/container-platform