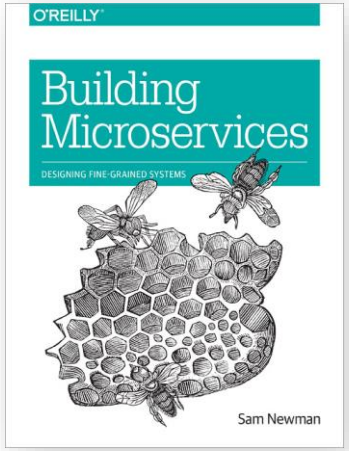
Microsoft

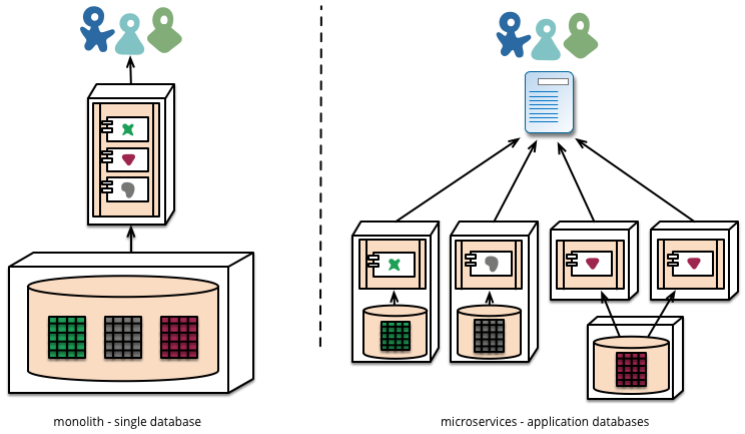
Introduction to microservices and Spring

Cloud-native architectures

Benefits of the microservices architectures

1. Scalability: scale each service based on load
2. High availability: create more resilient systems
3. Velocity: continuous delivery, team autonomy, and unbundled release trains

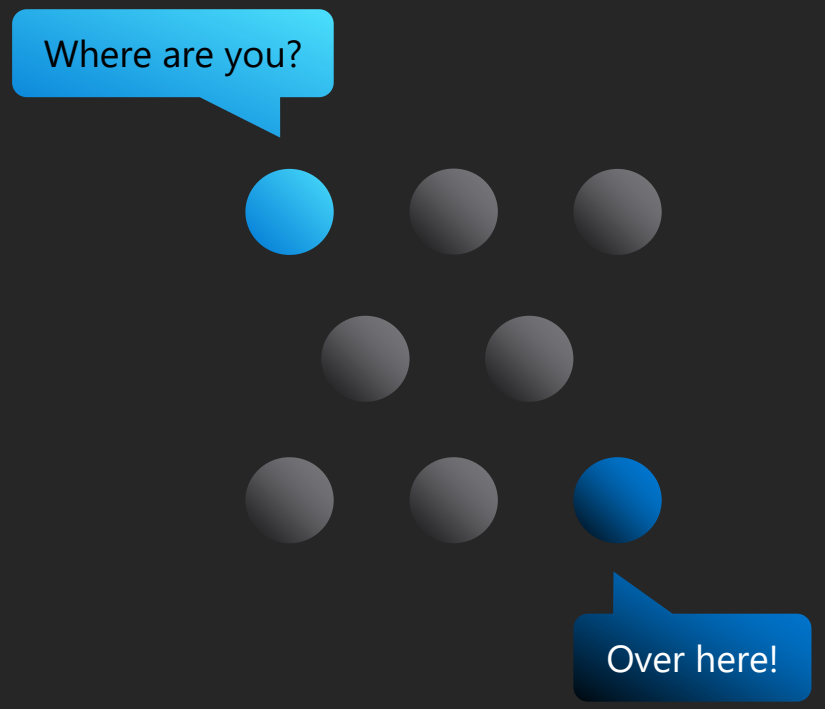




Service Discovery – 1

A microservice needs to discover the IP address/port number of dependency

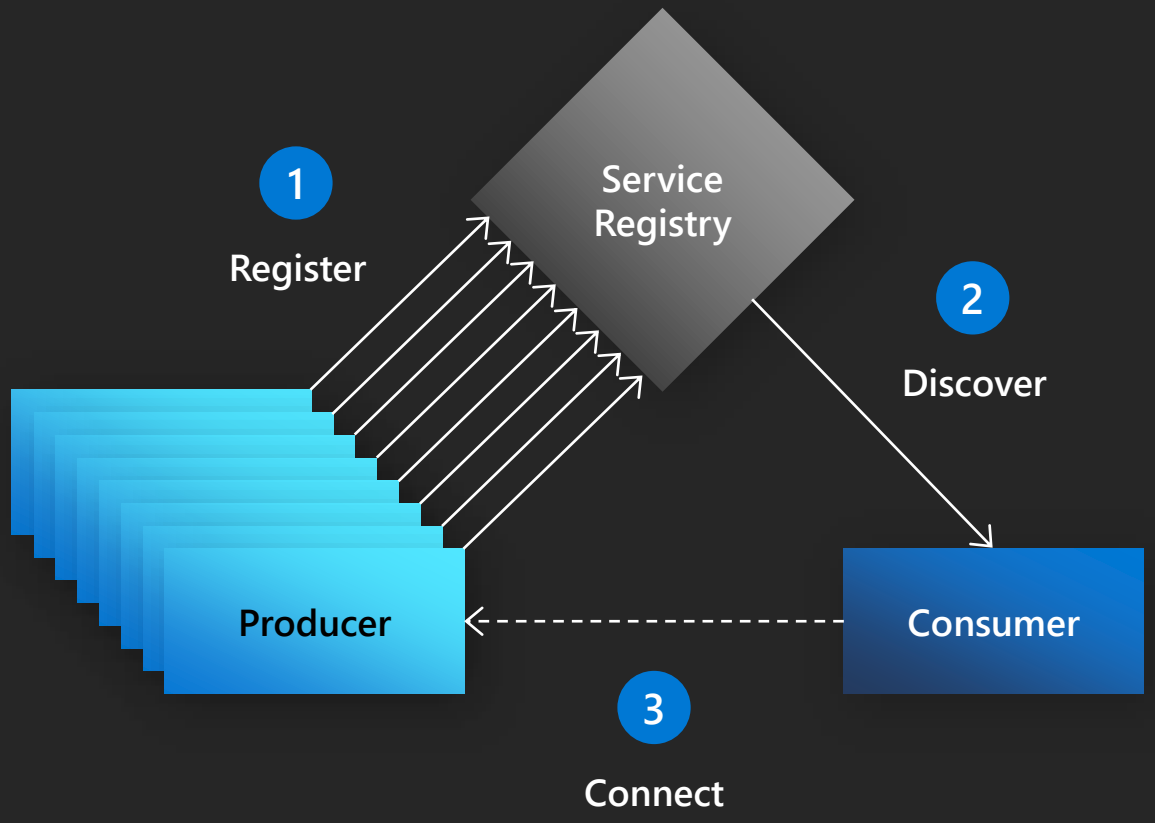
- Microservices are scaled up and down dynamically, thus having ephemeral IP addresses
- How to determine which microservices are healthy and ready to accept requests



Service Discovery – 2

Uses Service IDs, not URLs, to locate services

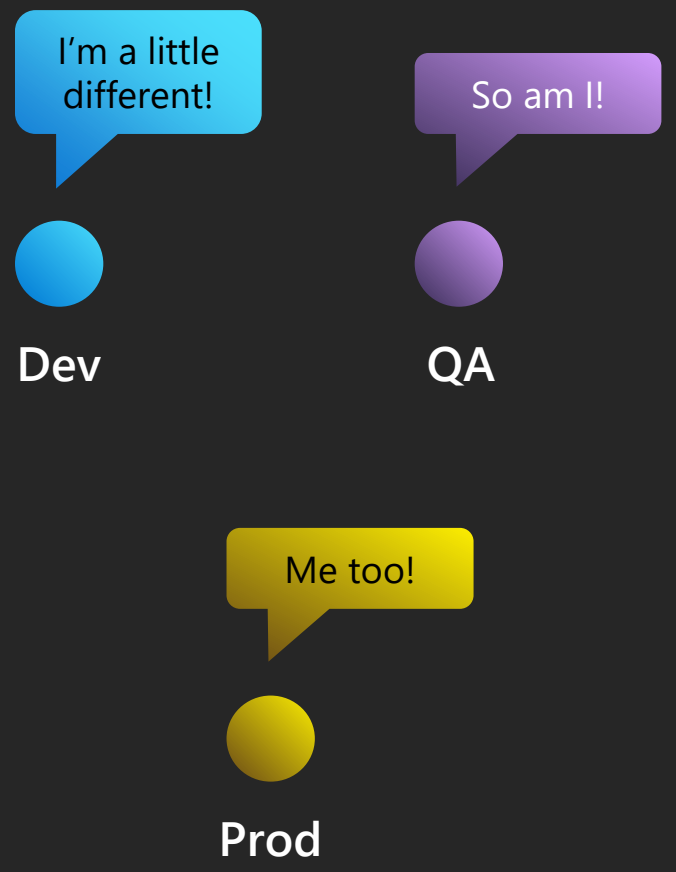
Client-side or server-side load balancing



Config Server – 1

A microservice is deployed to multiple environments (dev/QA/prod)

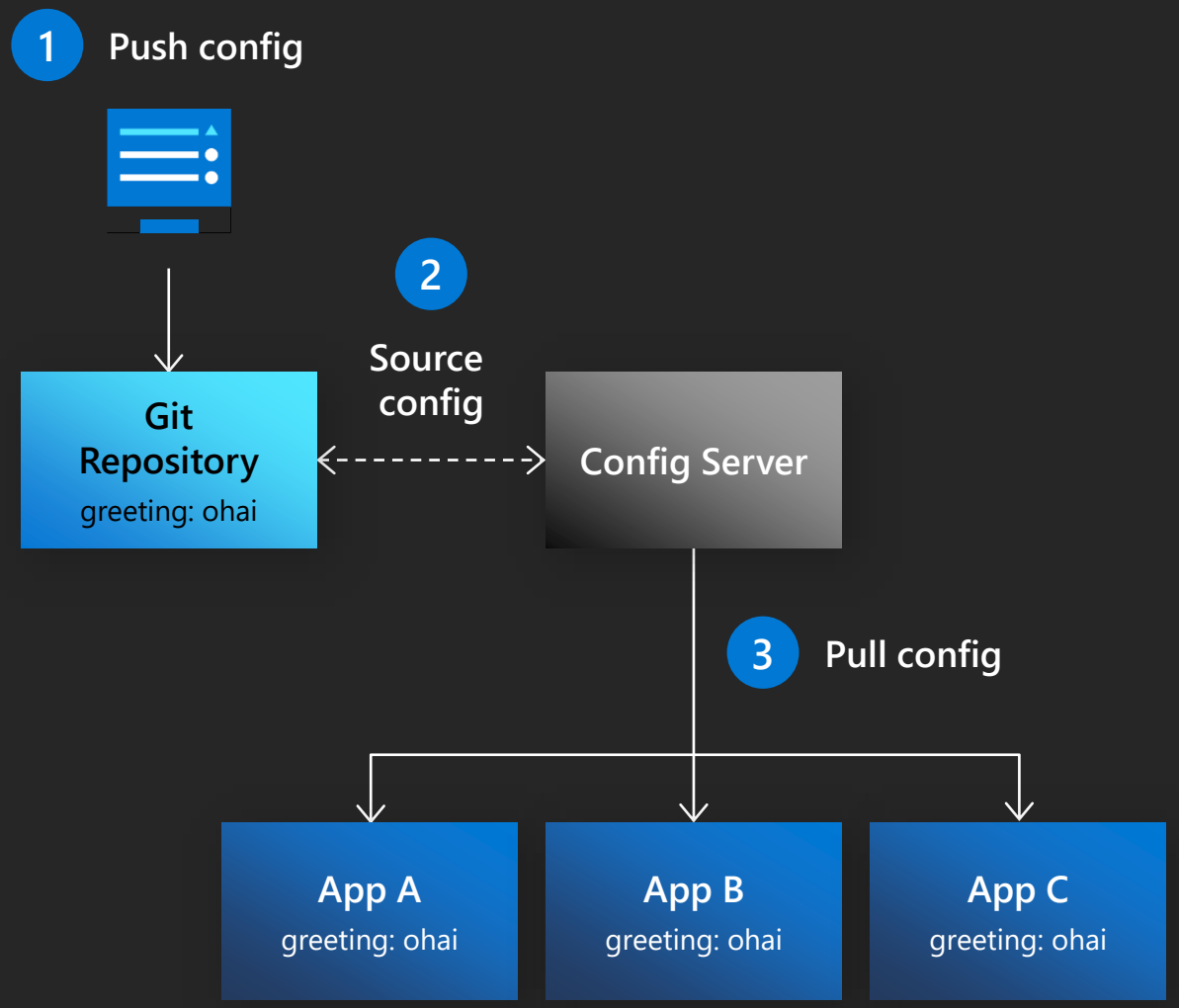
- There are configuration differences between each environment
- Multiple instances of a microservice run in each environment to meet scalability and availability requirements
- Multiple versions of a microservice can be running at the same time to ensure zero downtime deployments, A/B testing, or backward compatibility
- Risk management requires an audit trail of every configuration change made



Config Server – 2

Local or remote git repositories

Configuration specified by environment, service, or system



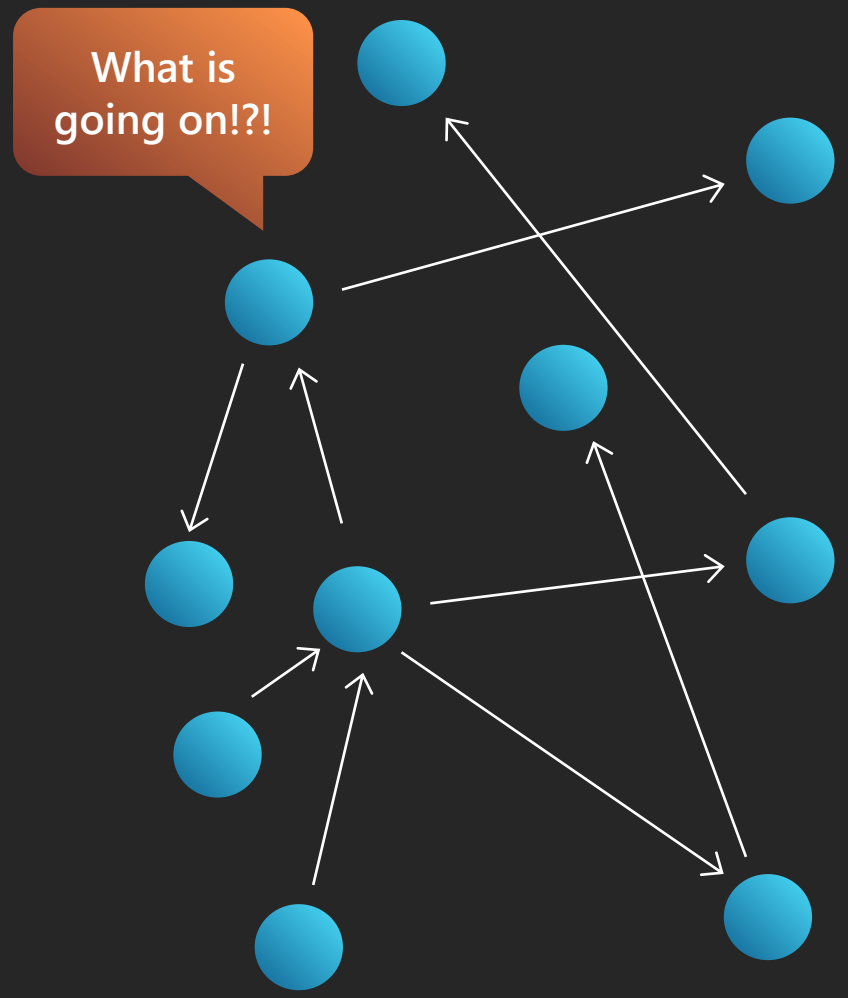
Distributed Tracing

Troubleshooting latency:

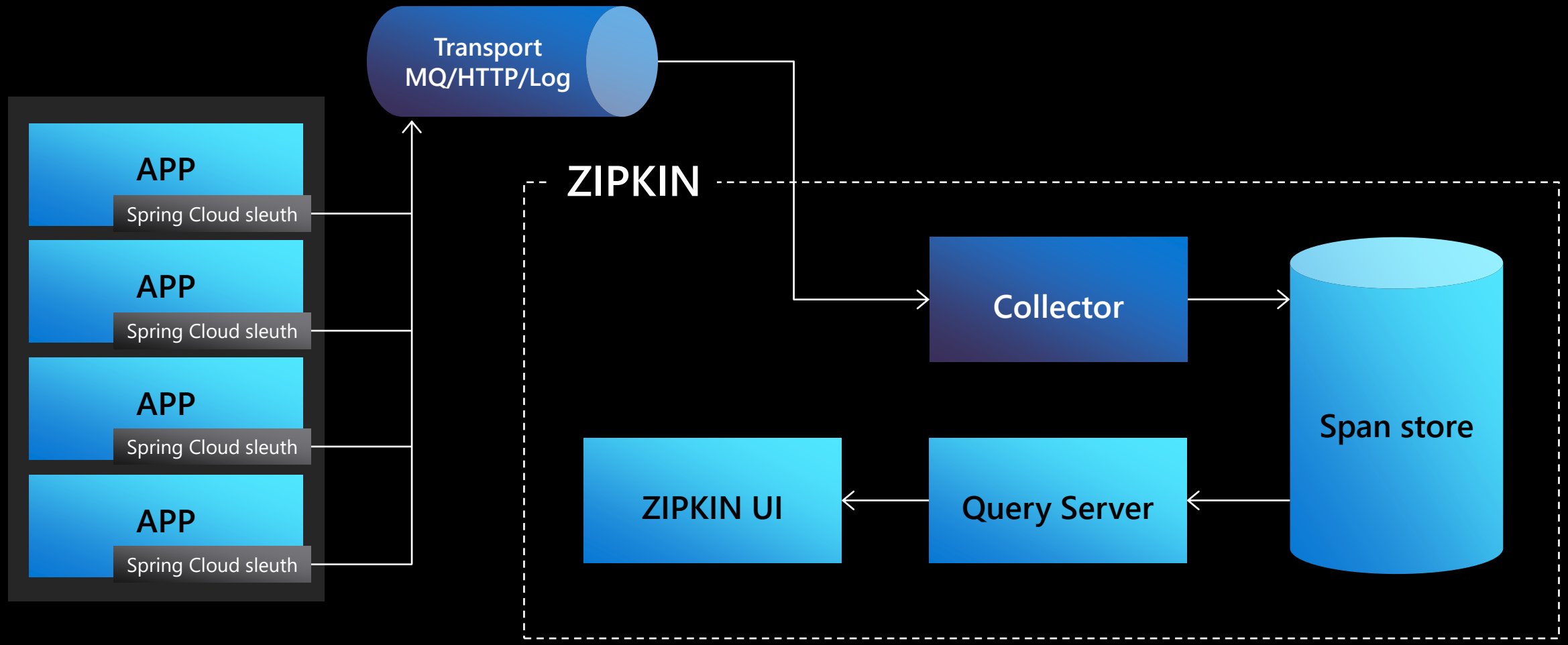
- When was the event? How long did it take?
- How do I know it was slow?
- Why did it take so long?
- Which microservice was responsible?

Distributed tracing:

- Distributed tracing is a process of collecting end-to-end transaction graphs in near-real time
- A trace represents the entire journey of a request



Integrate distributed tracing to your apps



Azure Spring Cloud

Agenda

1. **Introduction**
   Spring apps development

2. **Azure Spring Cloud overview**
   What it does and the benefits it provides

3. **Next steps**
   How you can get started with Azure Spring Cloud

What is Spring?

The best Java application development framework

Productive

- Accomplish practically any Java development task
- Simple, fully comprehensive, and modular
- Deployable/testable/portable
- Clear and well-documented with great online guides

Popular

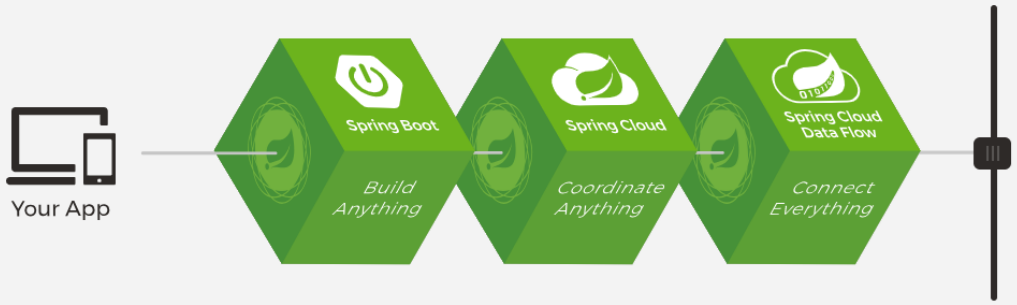
- More than 50% of Java developers use Spring Boot (JVM
- Mag)—there's over 3 million visits to Spring Initializr every year
- Permissive Open-Source License (Apache 2.0)
- Vibrant, passionate, and committed community

Trusted

- World's #1 IoC/Dependency Injection Framework
- Proven in production since 2004
- Enterprise distribution and commercial support available

spring by Pivotal

Spring: the source for modern java



Spring Boot

BUILD ANYTHING

Spring Boot is designed to get you up and running as quickly as possible, with minimal upfront configuration of Spring. Spring Boot takes an opinionated view of building production-ready applications.

Spring Cloud

COORDINATE ANYTHING

Built directly on Spring Boot's innovative approach to enterprise Java, Spring Cloud simplifies distributed, microservice-style architecture by implementing proven patterns to bring resilience, reliability, and coordination to your microservices.

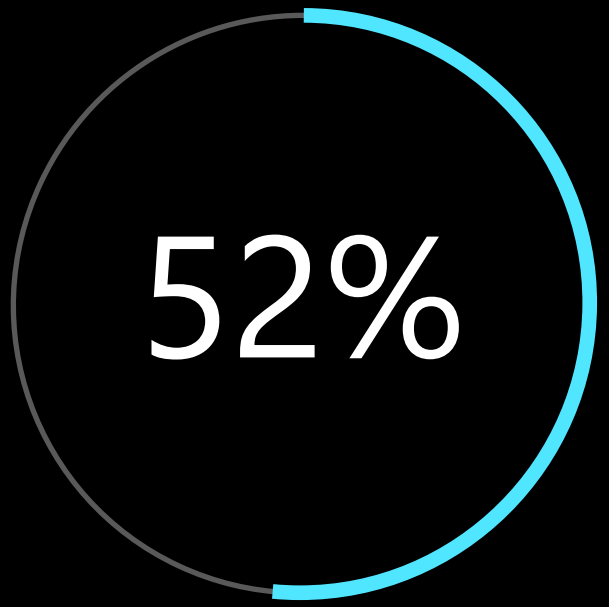
Spring Cloud Data Flow

CONNECT ANYTHING

Connect the Enterprise to the Internet of Anything—mobile devices, sensors, wearables, automobiles, and more. Spring Cloud Data Flow provides a unified service for creating composable data microservices that address streaming and ETL-based data processing patterns.

Spring is the most popular Java framework

Significant YoY growth and developer adoption



of developers use Spring Boot as their only or primary development platform

Source: State of Spring 2020 Report - https://tanzu.vmware.com/content/ebooks/state-of-spring-2020

Spring-based microservices development

Spring Boot

Build anything

Designed to get you up and running as quickly as possible, with minimal upfront configuration of Spring

Spring Cloud

Coordinate anything

Provides a set of tools that makes communication between microservices easier

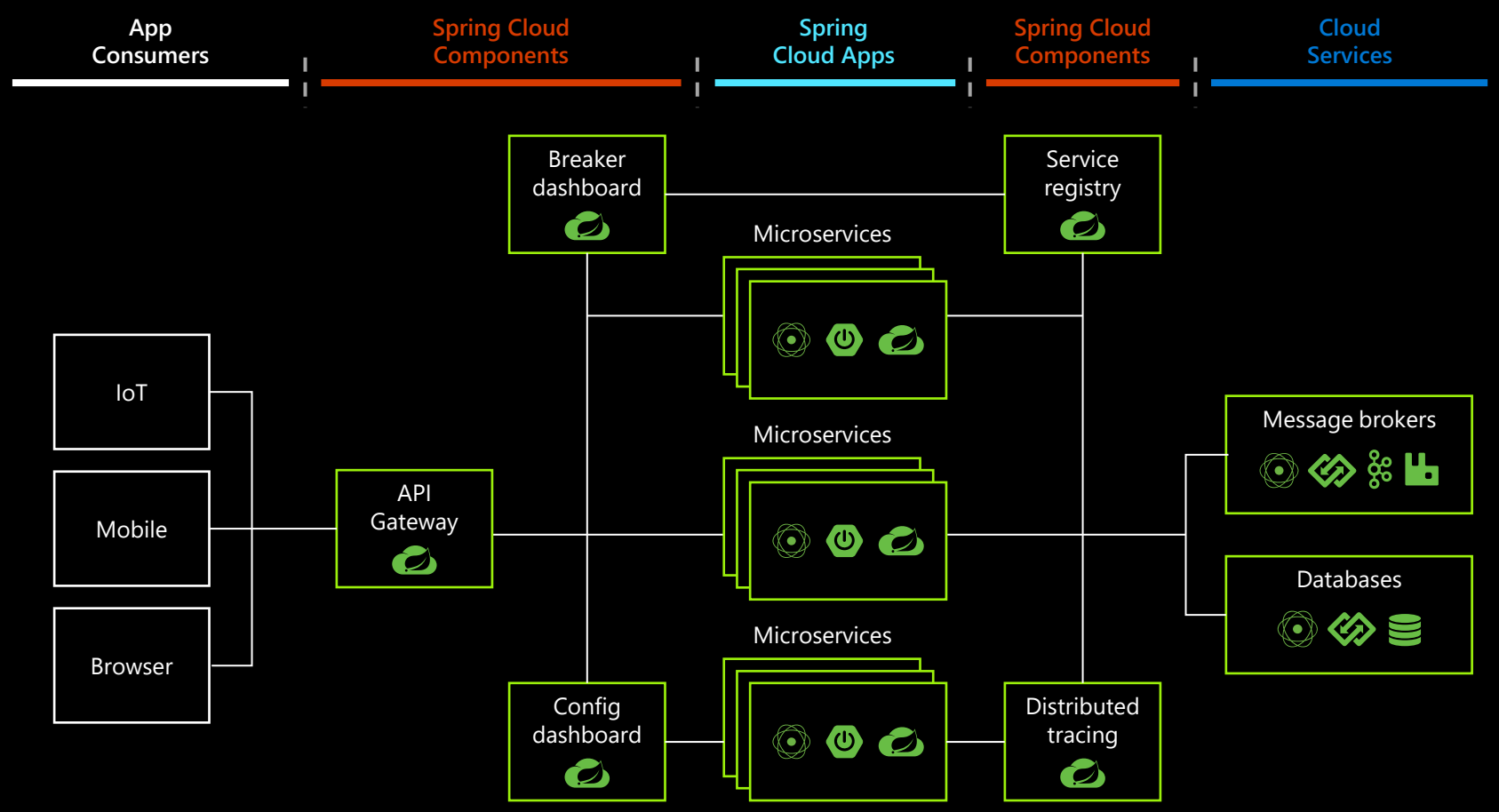
Common challenges for Spring applications

Customers need to manage infrastructure, updates, troubleshooting

High effort required to manage cloud infrastructure for Spring Boot applications

Application lifecycle is **difficult to manage**

Painful to troubleshoot application issues



Azure Spring Cloud

Fully managed Spring Cloud service, jointly built and operated with VMware

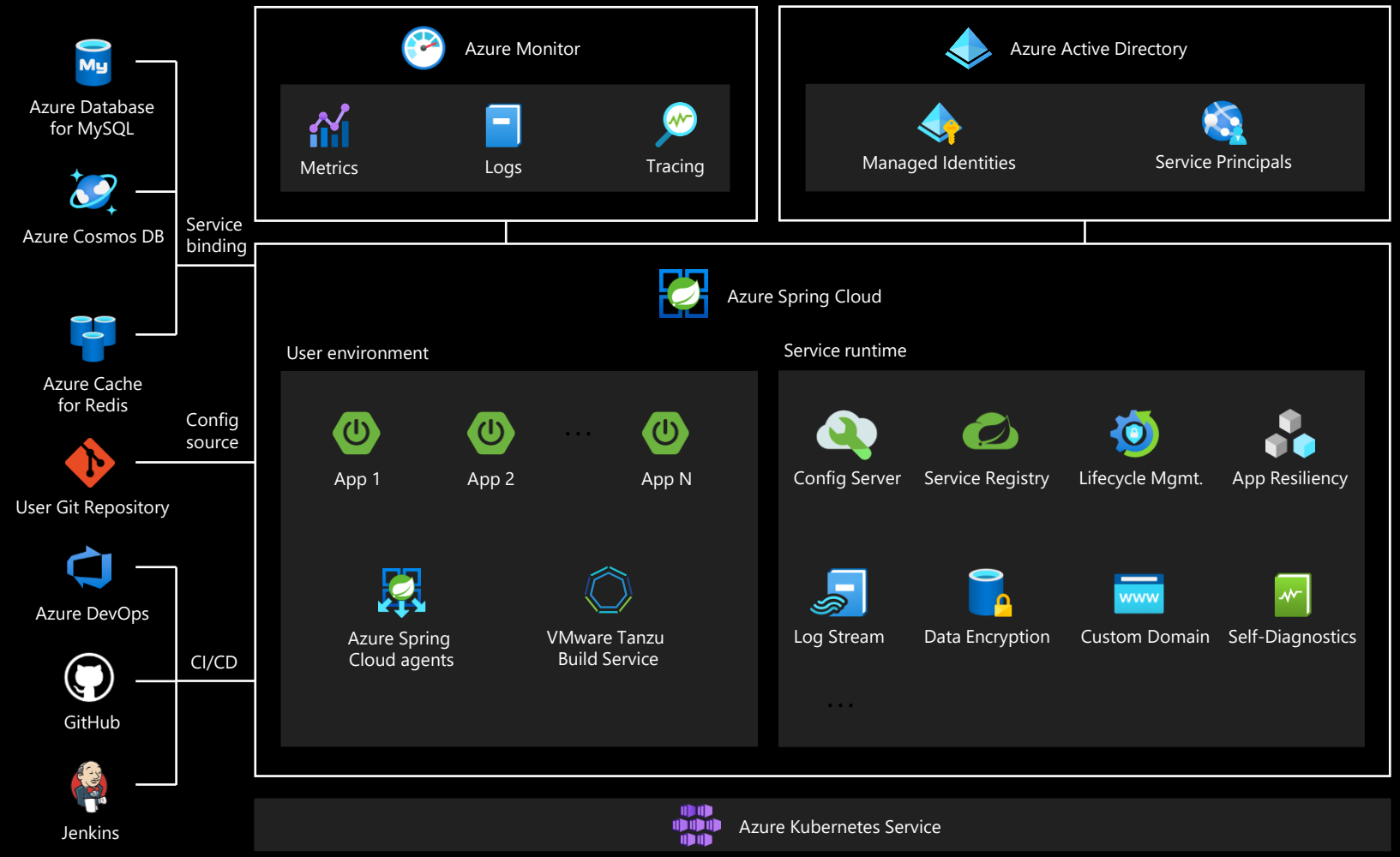
More choices and full integration into Azure's ecosystem and services

Enterprise ready

Simplify your cloud development for Spring applications

Responsibilities	DIY with Spring Boot	Azure Spring Cloud Service
Application iteration, debugging	Customer	Customer
CI/CD	Customer	VMware
Build and manage clusters	Customer	VMware
Host Spring Cloud middleware	Customer	VMware
Monitoring and logging	Customer	VMware
Scaling	Customer	VMware
Patching	VMware	VMware
Support	VMware	VMware

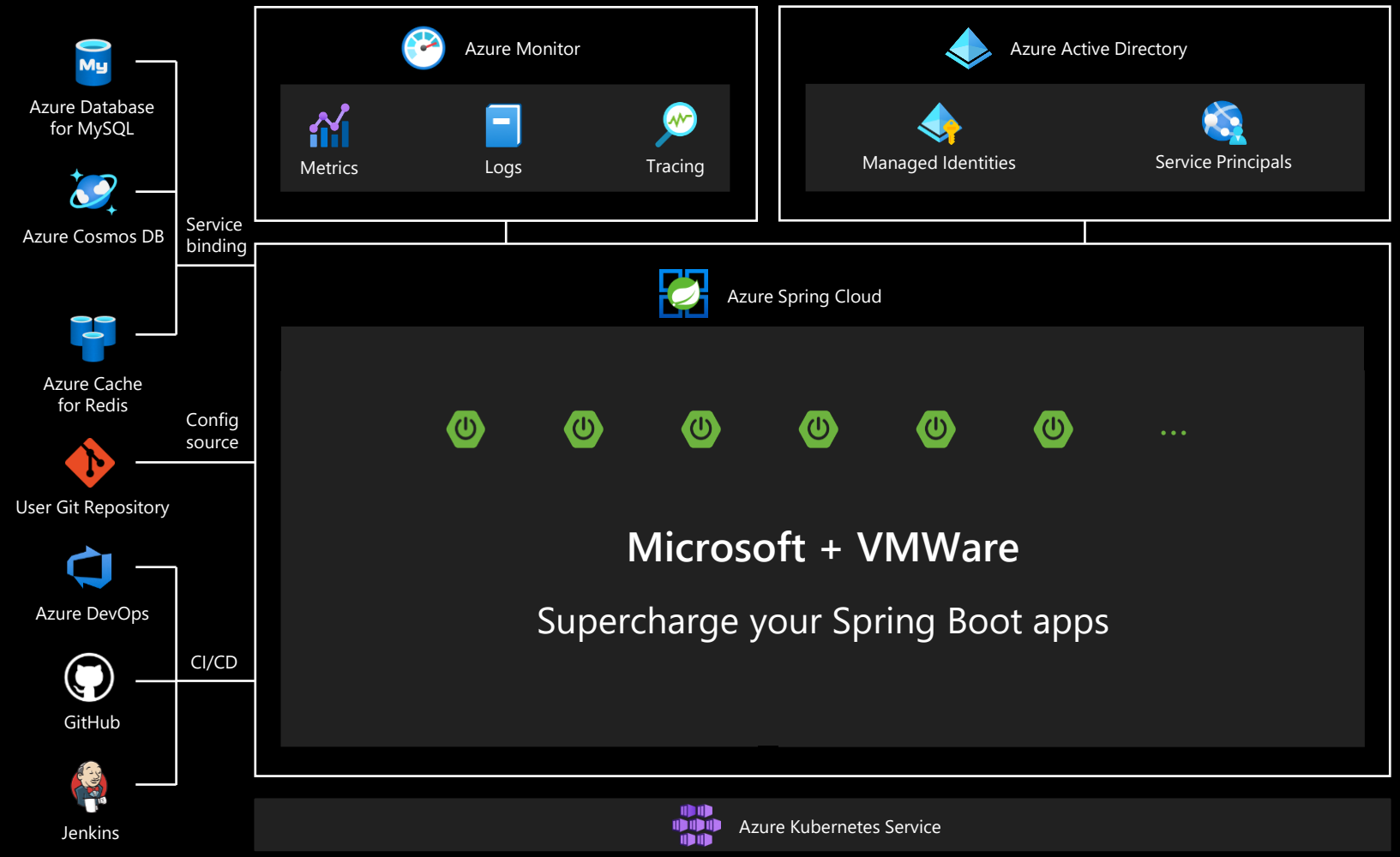
Customer VMware Microsoft



Simplify your cloud development – focus on on your Spring applications

Responsibilities	DIY with Spring Boot	Azure Spring Cloud Service
Application iteration, debugging	Customer	Customer
CI/CD	Customer	VMware
Build and manage clusters	Customer	VMware
Host Spring Cloud middleware	Customer	VMware
Monitoring and logging	Customer	VMware
Scaling	Customer	VMware
Patching	VMware	VMware
Support	VMware	VMware

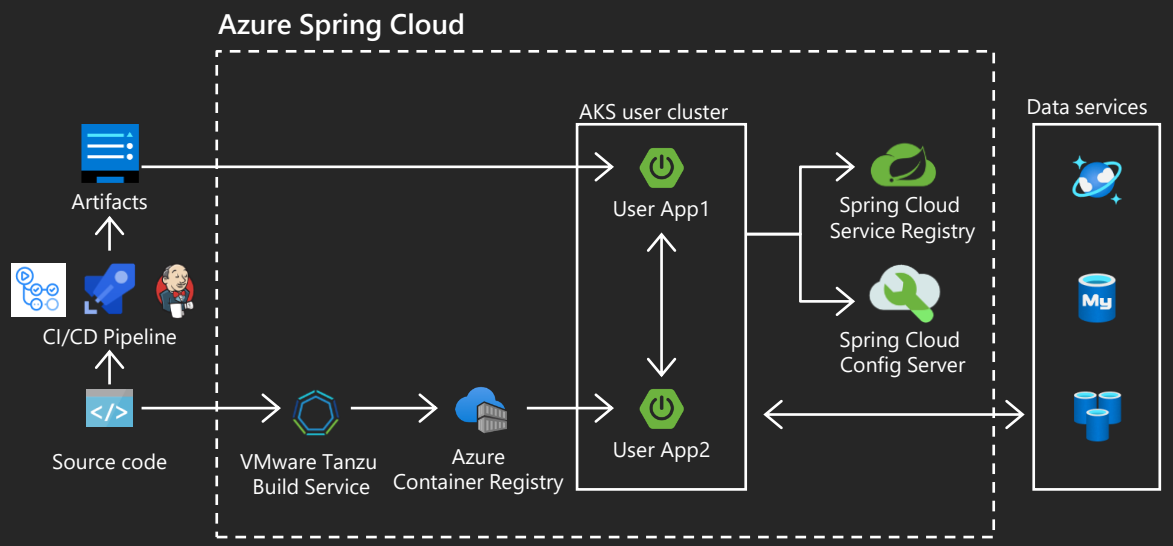
Customer VMware Microsoft



Built-in application lifecycle management

Simple app lifecycle management

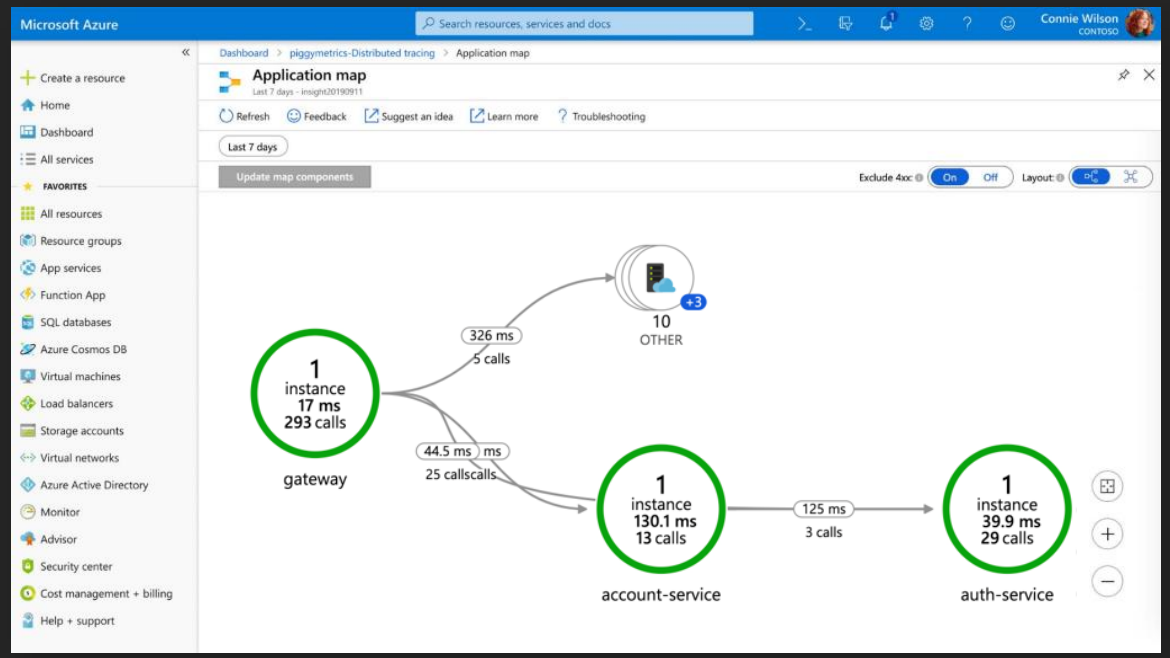
- Easily deploy source code or build artifacts
- Automatically wire your app with Spring Cloud infrastructure
- Integrated CI/CD pipeline for deployment



Ease of monitoring

Gain insights with Azure Monitor

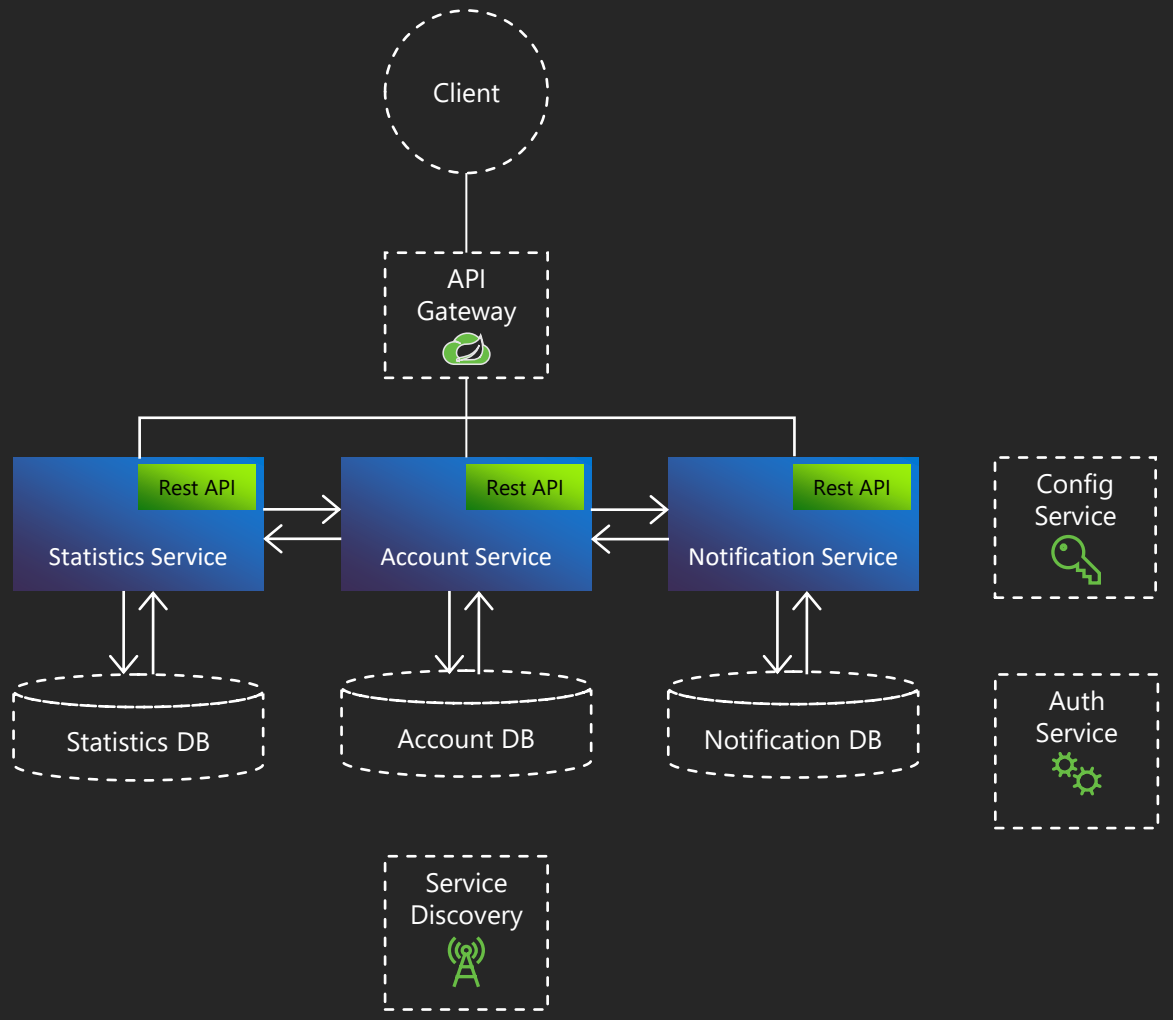
- View aggregated logs, system and JVM metrics
- Distributed tracing
- Stream logs in real-time
- Threshold alerting



Demo

Deploy Spring Cloud app to Azure without worrying about:

- Infrastructure and scaling
- Spring Cloud middleware: config, registry, tracing and gateway, or monitoring



piggymetrics-1031 | Apps

Azure Spring Cloud | Directory: Microsoft

Create App Refresh

Filter by app name

6 items

Name	Provisioning Status	Running Instance	Registered Instance	Persistent Storage
abcabc	Succeeded	1/1	1/1	Disabled
account-service	Succeeded	1/1	1/1	Enabled
auth-service	Succeeded	3/3	3/3	Disabled
gateway	Succeeded	4/4	4/4	Disabled
notification-service	Succeeded	1/1	1/1	Disabled
statistics-service	Succeeded	1/1	1/1	Disabled

piggymetrics-1031 | Diagnose and solve problems

Azure Spring Cloud | Directory: Microsoft

Search (Ctrl+/)

- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems

Settings

- Apps
- Config Server
- Deployments
- TLS/SSL settings
- Test endpoint keys
- Properties
- Locks
- Export template

Search for common problems, tools and more

Common problems

Explore the most common problems for your resource. Select Troubleshoot to run an automated troubleshooter, follow do-it-yourself troubleshooting steps, o
range of troubleshooting tools.

No health related issues found. View resource health dashboard

My application cannot start
Troubleshoot

My application crashes or throws an unexpected error
Troubleshoot

My application experiences high CPU usage or high memory usage
Troubleshoot

I encountered a problem in creating Azure Spring Cloud service ins...
Troubleshoot

I cannot deploy a JAR package
Troubleshoot

I cannot deploy a source package
Troubleshoot

Microsoft Azure (Preview)

Search resources, services, and docs (G+/)

Home >

piggymetrics-1031 | Logs

Azure Spring Cloud | Directory: Microsoft

Search (Ctrl+/)

- Apps
- Config Server
- Deployments
- TLS/SSL settings
- Test endpoint keys
- Properties
- Locks
- Export template

Monitoring

- Alerts
- Metrics
- Diagnostic settings
- Logs
- Distributed tracing

Support + troubleshooting

Example queries

Show Queries | Documentation

Resource Type

Resource Type : Azure Spring Cloud

Add filter

★ Favorites

All Queries

Azure Spring Cloud

AZURE SPRING CLOUD

Show the application logs which contain th...

Show the application logs which contain the "error" or "exception" terms in the last hour.

Resource Type: Azure Spring Cloud +2

Run | Load to editor

Example query

Show the error and exception number of ea...

Show a pie chart of the number of the logs containing the "error" or "exception" terms in the...

Run

Example query

Show the config server logs

Filter the config server logs with the log level.

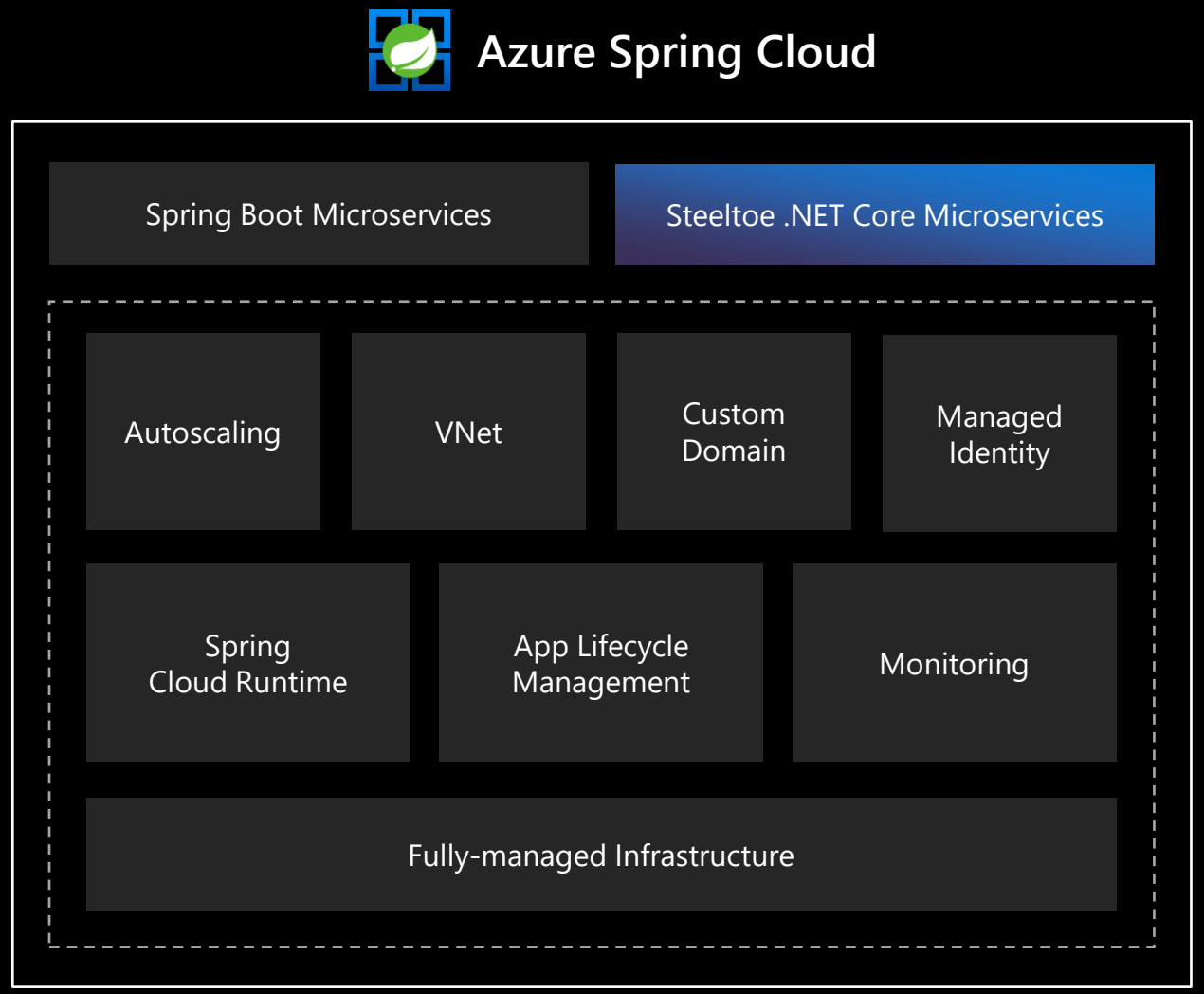
Run

Example query

Steeltoe .NET application support (Public Preview)

Run Steeltoe .NET Core apps in Azure Spring Cloud

- Leverage platform-level features for application lifecycle management, monitoring, and network isolation, same as Spring Boot apps
- Enable Java and .NET Core apps to run under the same Spring Cloud environment
- Powered by Steeltoe: a client library to leverage Spring Cloud config, Service Registry, etc., for .NET apps
- Publish Steeltoe .NET apps into Azure Spring Cloud directly in Visual Studio



Building new services rapidly with Azure Spring Cloud

Swiss Re

"Azure Spring Cloud allows our teams to build new business services rapidly, as the platform and underlying infrastructure is fully managed. The platform is integrated with the Azure ecosystem, which enables us to achieve the desired level of automation and means to operate the services securely."

Nicholas Andres
Head IT Group Finance Program

Challenge

Managing infrastructure, security testing, and performance monitoring for Spring apps was taking time away from delivering new features and services to the business.

Solution

Azure Spring Cloud handles infrastructure management and integrates with other Azure services to provide a secure and reliable platform to run Spring Boot applications.

Results

Cloud scale performance and flexibility

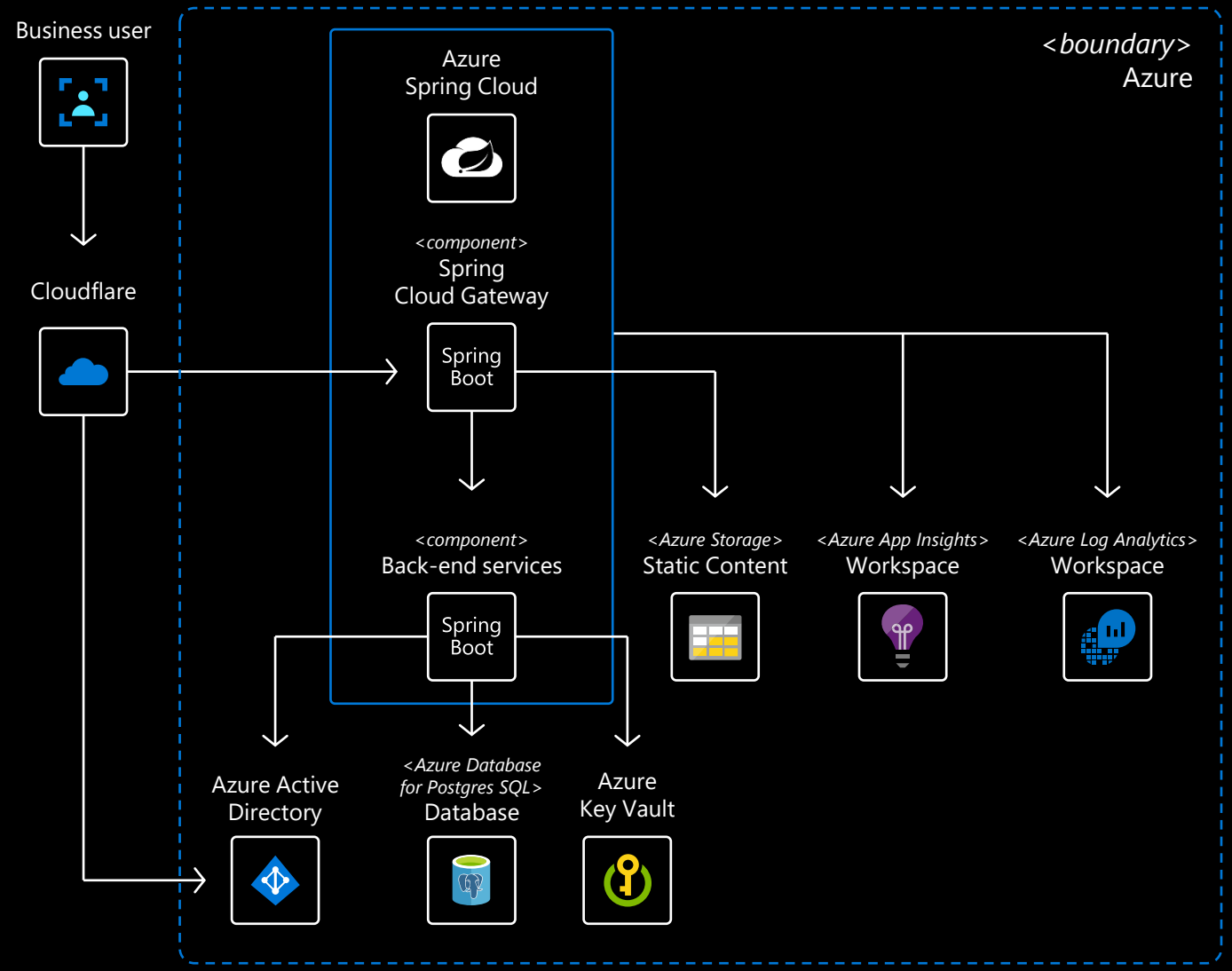
Automated security and reliability

Increased developer velocity

Swiss Re—Azure Spring Cloud architecture

Swiss Re

- Cloudflare proxies requests to the Spring Cloud Gateway application
- Spring Cloud Gateway routes to the back-end services using the Eureka service registry
- Back-end services can call other back-end services via Eureka look-ups
- The managed identities of the back-end services are used to access Key Vault, Microsoft Graph and to retrieve static content from Azure Storage
- Azure Spring Cloud ensures logs and metrics are sent to Log Analytics and Application Insights, respectively
- Azure Database for PostgreSQL is accessed via JDBC



Packaging tiers and pricing

	Basic For tire kicking and individual dev/test	Standard For general purpose production workloads
Base price	$170.82/month or $0.234/hr	$602/month or $0.825/hr
Included vCPU and memory	2 vCPU, 5 GB	8 vCPU, 16 GB
Additional vCPU price	$0.062/hour	$0.00825/hour
Additional memory price	$0.00699/hour	$0.0783/hour
Max app instance size	1 vCPU, 2 GB	4 vCPU, 8 GB
Max app instances	25	500
SLA	–	✓
Highly-available Spring Cloud runtime	–	✓
Custom domains/SSL	–	✓
VNET integration	–	✓
Blue/green deployment	–	✓

20 vCPU and **40 GB** memory on Standard Tier

Base unit: $602

8 vCPU
16 GB

+

vCPU overage: 12*$56.3

12 vCPU

+

Memory overage: 24*$5.94

24 GB

= $1,420

- Azure Free Credit programs can be applied to this service ($200 credit will cover more than one month of Basic tier)
- Though above price is estimated for one month; all meters are charged by **seconds** based on actual usage
- For each service instance, Azure Spring Cloud charges for one "vCPU and memory group duration," which includes some vCPUs and memory; when you exceed either, or both, of the capacities included in the "vCPU and memory group duration," you will be billed for the actual additional usage based on the total "overage memory duration" and "overage vCPU duration"

Spring integration with Azure

Spring developers can leverage 30+ starters to connect to Azure services with a few lines of configuration and minimal code changes

Spring Cloud

App Configuration
Event Hubs
Service Bus
Storage
Redis
Functions

Spring Resource

Storage

Spring Data

SQL Database
MySQL
PostgreSQL
Maria DB
Cosmos DB

- SQL
- MongoDB
- Cassandra
- Gremlin

Spring Security

Active Directory (AAD)
AAD B2C

R2DBC

SQL Database
PostgreSQL
MySQL

Spring Cache

Redis Cache

Spring Messaging

Service Bus

Micrometer

Monitor

Azure Spring Cloud roadmap

End of ‘Q3 2020

Generally Available

.NET Core w/ Steeltoe

West Europe, East US
Southeast Asia, West US 2

‘Q4 2020

Security
- Non-transient outgoing IPs for apps

Troubleshooting
- Trace external dependencies and support Micrometer / Resilience4J with App Insight Java in-process Agent (preview)

Tooling
- VS Code Extension to build and deploy Spring Boot apps

East US2, Central US, Australia East, UK South, North Europe, South Central US

‘Q1 2021

Security
- VNET (public regions) GA

App management
- Autoscaling GA

China East 2, West US, UAE North, Canada Central

‘Q2 2021

Cost Control
- Reduced app size minimum (0.5 core)

Automation
- Automate CD and manage deployments with Azure pipeline task

Security
- VENT (China East 2) GA

East Asia, Korea Central, India Central

‘Q3 2021

Troubleshooting
- App Insight Java in-process Agent integration GA
- 3rd party APM integration
- Monitor and alert app events (e.g., start/stop/restart)
- More logs of built-in ingress controller

Security

‘Q4 2021

Troubleshooting
- Support Thread/Core Dump
- More logs of built-in Service Registry

Security
- Support user assigned identity

Automation
- Azure GitHub Actions task

Cost optimization for Dev/Test
- Suspend/Resume

Configuration
- Mount external storage as persistent volume

Japan East, South Africa North
and more

Learn more

- https://aka.ms/get-started-with-azure-spring-cloud
- Starters to interact with Azure services: https://azure.microsoft.com/services/spring-cloud/
- https://docs.microsoft.com/azure/developer/java/spring-framework/

Learn Azure Spring Cloud with self-paced workshops

- https://docs.microsoft.com/learn/modules/azure-spring-cloud-workshop/
- https://github.com/microsoft/azure-spring-cloud-training

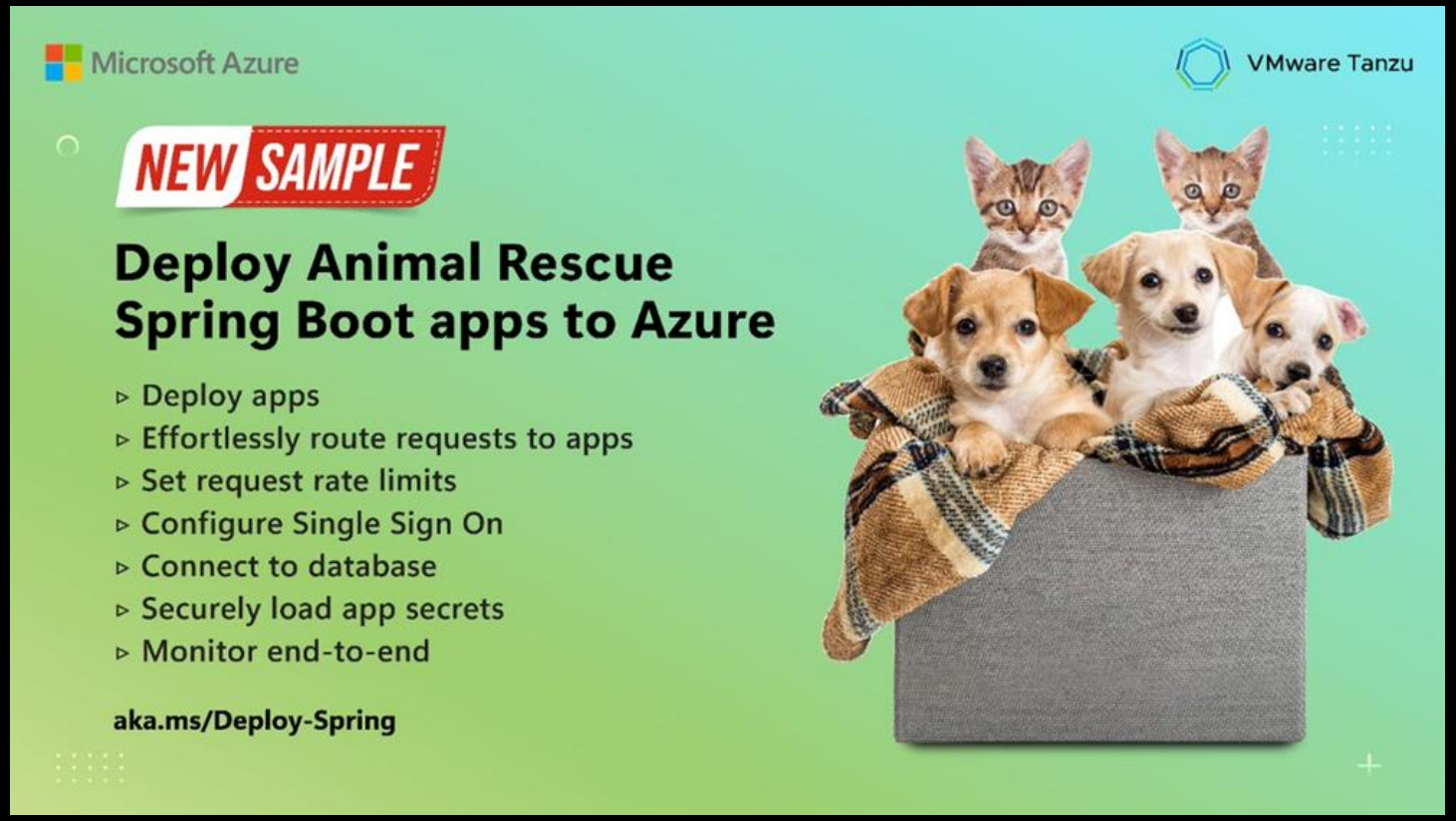
Give us your feedback

- https://aka.ms/springazure

SAMPLE

https://github.com/azure-samples/animal-rescue

Ready to take Spring Boot apps for a spin? Check out - http://aka.ms/Deploy-Spring new step-by-step guide to deploy and scale Spring Boot apps on Azure



https://github.com/sdadha/azure-spring-cloud-training

Microsoft Azure | VMware Tanzu

Azure Spring Cloud Enterprise

Microsoft Azure | VMware Tanzu

Azure Spring Cloud

Microsoft Azure | VMware Tanzu

Azure Spring Cloud

Home for enterprise Spring Boot applications

Morgan Stanley

Swiss Re

Raley's

BOSCH

DIGITAL REALTY

Kroger FRESH FOR EVERYONE™

liantis

Microsoft Azure | VMware Tanzu

Azure Spring Cloud Enterprise

Azure Spring Cloud Enterprise

Ship faster

with VMware Tanzu components

Unlock Spring's full potential

with VMware Spring Runtime Support

- Build packs with app integrations
- Management of app container creation
- Out-of-the-box SSO with any identity provider
- Out-of-the-box throttling and caching
- Accelerators for hardening app config and best practices
- Cloud-native streaming and batch data processing pipelines

...

Ship faster with VMware Tanzu components

- Tanzu Build Service
- Tanzu Application Configuration Service
- Tanzu Service Registry
- Tanzu Spring Cloud Gateway *
- Tanzu Spring Cloud Data Flow *
- Tanzu Application Accelerator *
- Application Live View for Tanzu *

...

** Roadmap is not confirmed and is subject to change*

Unlock Spring's full potential

With VMware Spring Runtime Support

Get 24x7 support

- AspectJ
- Micrometer
- Reactor
- Spring AMQP
- Spring Batch
- Spring Boot
- Spring Cloud Commons
- Spring Cloud Config
- Spring Cloud Netflix
- Spring Cloud Bus
- Spring Cloud Cloud Foundry
- Spring Cloud Open Service Broker
- Spring Cloud Consul
- Spring Cloud Security
- Spring Cloud Sleuth
- Spring Cloud Zookeeper
- Spring Cloud Kubernetes
- Spring Cloud CLI
- Spring Cloud OpenFeign
- Spring Cloud Gateway
- Spring Cloud Function
- Spring Cloud Contract
- Spring Cloud Task
- Spring Cloud Stream
- Spring Cloud Stream Binder for Apache Kafka®
- Spring Cloud Stream Binder for RabbitMQ
- Spring Cloud Stream Binder for Kafka Streams
- Spring Cloud Vault
- Spring CredHub
- Spring Data for Apache Cassandra™
- Spring Data Commons
- Spring Data KeyValue
- Spring Data LDAP
- Spring Data JDBC
- Spring Data JPA
- Spring Data MongoDB
- Spring Data GemFire
- Spring Data for Apache Geode™
- Spring Data Redis
- Spring Data REST
- Spring Data Solr
- Spring Framework
- Spring HATEOAS
- Spring Integration (Core modules + Kafka)
- Spring for Apache Kafka®
- Spring LDAP
- Spring Kerberos
- Spring REST Docs
- Spring Retry
- Spring Statemachine
- Spring Security
- Spring Security OAuth
- Spring Security SAML
- Spring Cloud Data Flow
- Spring Session
- Spring Session for MongoDB
- Spring Session for GemFire/ Apache Geode™
- Spring Tool Suite
- Spring Tools 4
- Spring Vault
- Spring Cloud Skipper
- Spring Cloud Stream/Task App Starters

Demo – Azure Spring Cloud Enterprise

Choose your pricing tier - Micr

ms.portal.azure.com/?AppPlatformExtension=enterprise#create/Microsoft.AppPlatform

Microsoft Azure (Preview) | Search resources, services, and docs (G+/) | asirveda@microsoft.com MICROSOFT (MICROSOFT.ONMI...

Home >

Azure Spring Cloud

Create

Basics | VMware Tanzu settings | Diagnostic settings

Azure Spring Cloud provides managed infrastructure and applicat
monitor and operate your Spring Boot applications.

Project Details

Select the subscription to manage deployed resources and costs.
manage all your resources.

Subscription * Azure Spring Cloud

Resource group * Asir-Enterprise

Create new

Service Details

Name * petclinic

Region * East US

Pricing * **Enterprise tier**
16 vCPUs, 32 Gi inclu
Free for private prev
Change

Enterprise tier is in Preview

Terms

Review and create | < Prev

Choose your pricing tier

Pricing tier	Basic For individual dev/test	Standard For production workloads	Enterprise For production workloads with VMware Tanzu components
Features			
Included vCPU and memory	2 vCPU, 4 Gi	8 vCPU, 16 Gi	16 vCPU, 32 Gi
Max app instance size	1 vCPU, 2 Gi	4 vCPU, 8 Gi	4 vCPU, 8 Gi
Max app instances	25	500	500
Spring Support	-	-	✓
VMware Tanzu components	-	-	✓
SLA	-	99.9%	99.9%
Custom domains	-	✓	Coming soon
VNET integration	-	✓	✓
Blue/Green deployment	-	✓	Coming soon
Pricing			
Estimated Price / month	170.82 USD + Overage costs	602.25 USD + Overage costs	Free for private preview

View pricing details for more information

Select

Azure Spring Cloud - Microsoft

ms.portal.azure.com/?AppPlatformExtension=enterprise#create/Microsoft.AppPlatform

Microsoft Azure (Preview) | Search resources, services, and docs (G+/) | asirveda@microsoft.com MICROSOFT (MICROSOFT.ONMI...

Home >

Azure Spring Cloud

Create

Basics | VMware Tanzu settings | Diagnostic settings | Application Insights | Networking | Tags | Review and create

Spring Support

24×7 support for the Spring Ecosystem from VMware.

Include Spring Support: Yes

Build Service

Executes reproducible container builds and keeps images up-to-date using kpack, a Cloud Native Buildpacks Platform.

Enable Build Service: Yes

Allocated Resources: 2 vCPU, 4 Gi

Service Registry

Provides a highly available registry for your services to dynamically discover and call other services.

Enable Service Registry: ☑

Allocated Resources: 1 vCPU, 2 Gi

Application Configuration Service

Provides centralized configuration with Git integration.

Enable Application Configuration Service: ☑

Allocated Resources: 1 vCPU, 2 Gi

Review and create | < Previous : Basics | Next : Diagnostic settings > | Download a template for automation

Azure Spring Cloud - Microsoft

ms.portal.azure.com/?AppPlatformExtension=enterprise#create/Microsoft.AppPlatform

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Home >

Azure Spring Cloud

Create

Basics | VMware Tanzu settings | Diagnostic settings | Application Insights | Networking | Tags | **Review and create**

Product details

Azure Spring Cloud
by Microsoft
Terms of use | Privacy policy

Pricing *

Enterprise tier
16 vCPUs, 32 Gi included (12 vCPUs, 24 Gi remaining)
Free for private preview
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Basics

Service Name	petclinic
Subscription	Azure Spring Cloud Dogfood Test v3 - TTL = 1 Days
Resource group	Asir-Enterprise
Region	East US

VMware Tanzu components

Create | < Previous : Tags | Next > | Download a template for automation

petclinic - Microsoft Azure

ms.portal.azure.com/?AppPlatformExtension=enterprise#@microsoft.onmicrosoft.com/resource/subscriptions/0753feba-86f1-4242-aff1-27938fb04531/resourcegroups/Asir-Ent...

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petclinic

Azure Spring Cloud | Directory: Microsoft

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- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems

Settings

- Apps
- Networking
- Properties
- Locks

VMware Tanzu components

- Build Service
- Service Registry
- Application Configuration Service

Monitoring

- Alerts
- Metrics
- Diagnostic settings

Delete | Feedback

Essentials | View Cost | JSON View

Service instance name	: petclinic	Subscription	: Azure Spring Cloud Dogfood Test v3 - TTL = 1 Days
Resource group	: Asir-Enterprise	Subscription ID	: 0753feba-86f1-4242-aff1-27938fb04531
Location	: East US	Pricing tier	: Enterprise
Status	: Succeeded		
Tags (change)	: Click here to add tags		

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Create App | Refresh | Feedback

Filter by app name

5 items

Name	Provisioning state	Running instance	Registration status
admin-server	Succeeded	1/1	1/1
api-gateway	Succeeded	1/1	1/1
customers-service	Succeeded	1/1	1/1
vets-service	Succeeded	1/1	1/1
visits-service	Succeeded	1/1	1/1

petclinic-microservices | Appli

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Investigate

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- Smart Detection
- Live Metrics
- Search
- Availability
- Failures
- Performance
- Troubleshooting guides (preview)

Monitoring

- Alerts
- Metrics
- Logs
- Workbooks

Usage

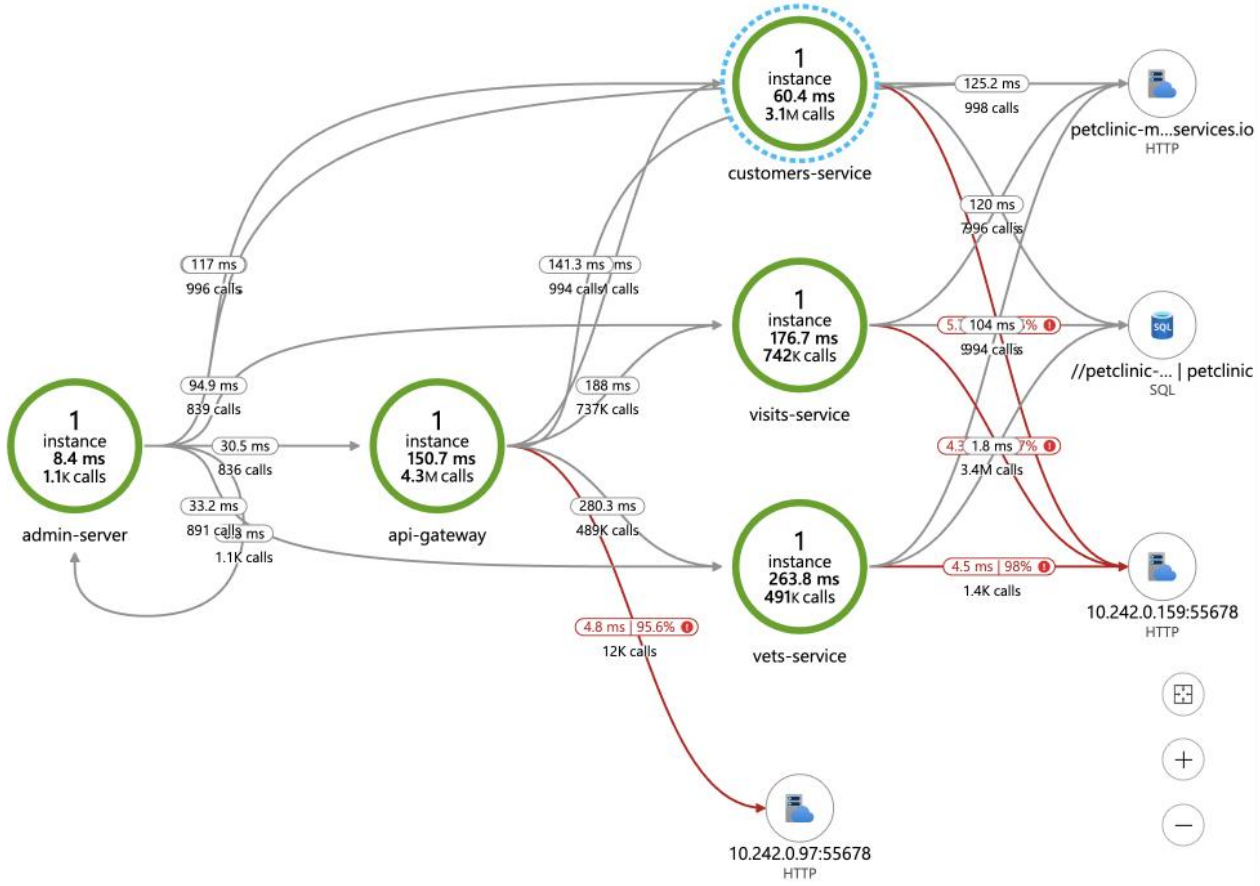
- Users
- Sessions
- Events
- Funnels
- User Flows
- Retention

Refresh | Feedback | Suggest an idea | Learn more | Troubleshooting

Last 4 hours

Update map components

Exclude 4xx: On Off | Layout:



petclinic-microservices - Micro

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petclinic-microservices | Metrics

Application Insights | Directory: Microsoft

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Investigate

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- Smart Detection
- Live metrics
- Transaction search
- Availability
- Failures
- Performance
- Troubleshooting guides (preview)

Monitoring

- Alerts
- Metrics
- Diagnostic settings
- Logs
- Workbooks

Usage

New chart | Refresh | Diagnose | Share | Feedback | Local Time: Last 12 hours (Automatic - 5 minut...

Custom Metrics Published by Petclinic Microservices

Add metric | Add filter | Apply splitting | Area chart | Drill into Logs | New alert rule | Pin to dashboard

petclinic-microservices, **petclinic_owner,** Count | petclinic-microservices, **petclinic_pet,** Count | petclinic-microservices, **petclinic_visit,** Avg

petclinic_owner (Count) petclinic-microservices 4.14 M

petclinic_pet (Count) petclinic-microservices 5.07 M

petclinic_visit (Avg) petclinic-microservices 281.86

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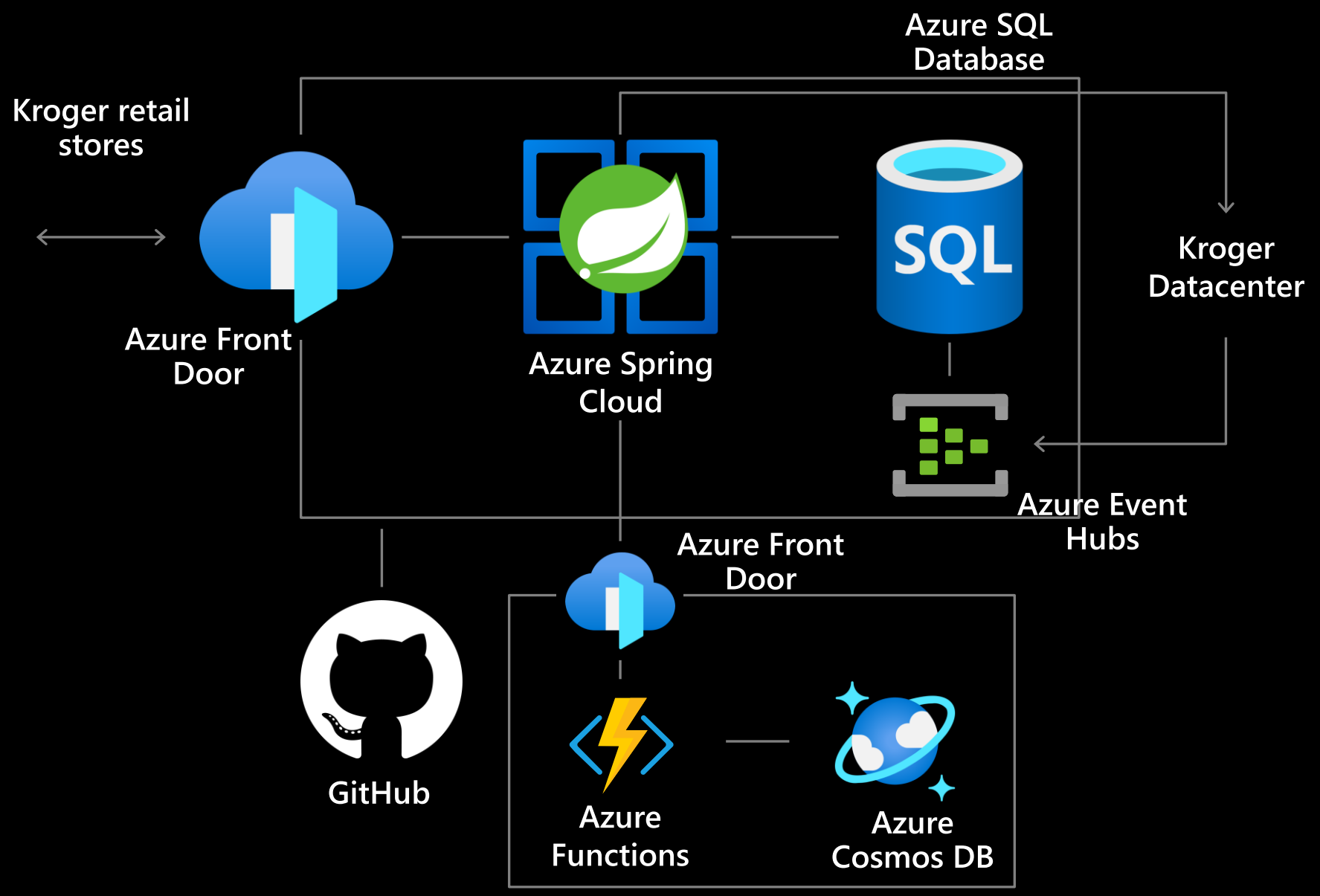
Microsoft Azure | Kroger

Kroger migrated Java apps to Azure to deliver great experiences for shoppers

"I talk about our move to the cloud like this—imagine if you're pulling into a racetrack pitstop and instead of changing the tires, you had to change out the whole engine. And in making the switch to Microsoft Azure, we changed out that engine—literally—overnight."

Doug Wilson, Senior Director of Software Engineering, Kroger

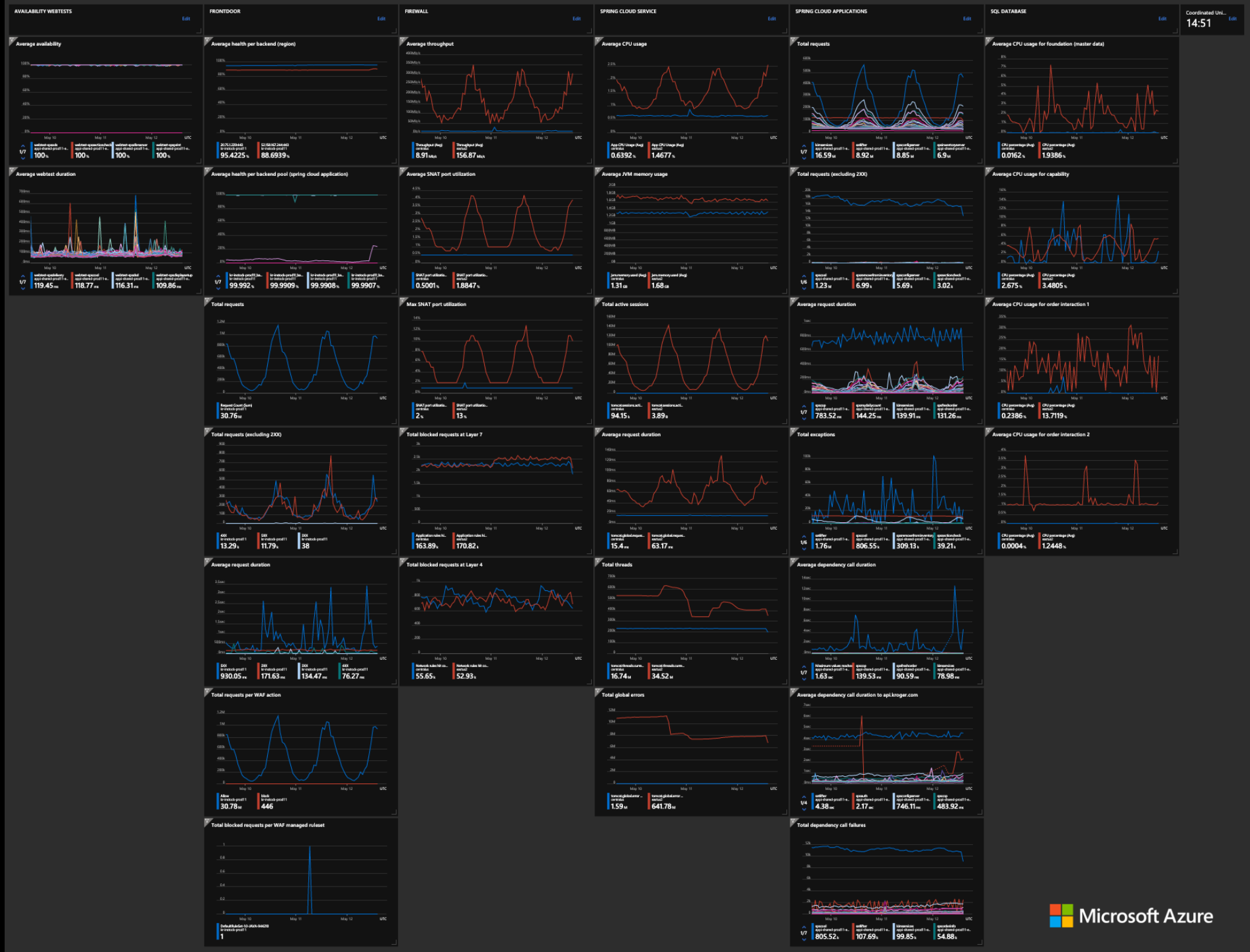
Kroger InStock – Architecture



Kroger

Microsoft Azure

InStock – End to end monitoring



Kroger

Microsoft Azure

Microsoft Azure | Raley's

Raley's uses **Azure Spring Cloud** to optimize, scale, and drive innovation

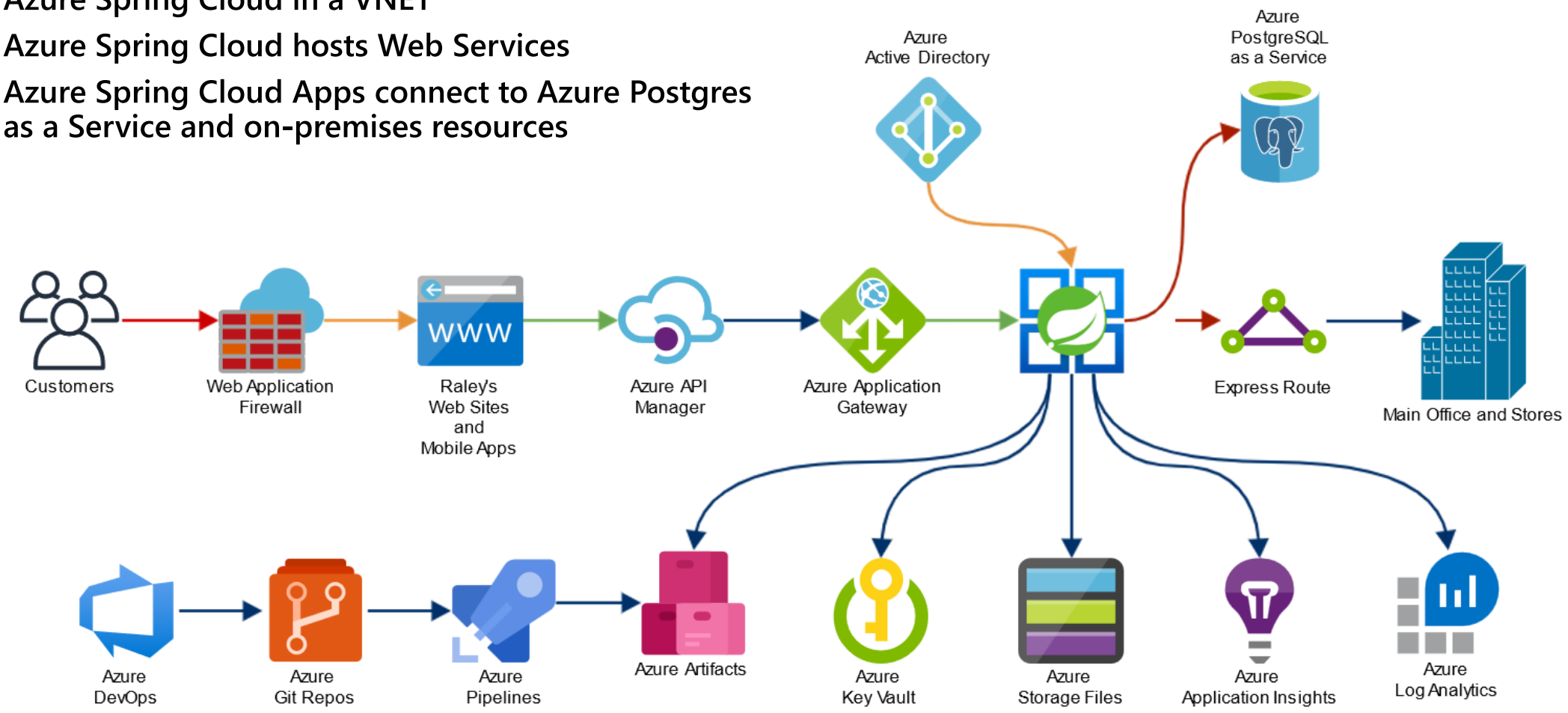
Raley's

Focus on apps and NOT Kubernetes or IaaS – improve operational efficiency

Challenge	• Services must remain operational and stable 24 hours a day. Recurring promotional offers drive customers to Raley's, creating predictable usage peaks.
Solution	• Monitor events and send alerts with Azure Monitor to ensure enough capacity is available to handle peaks. • Autoscale helps applications perform their best when demand changes. • Log stream and aggregated log search pinpoint problems quickly.
Results	• Azure Spring Cloud enables Raley's to quickly develop, deploy, and monitor apps while exceeding customer and developer expectations.

> "Spring Boot and Azure Spring Cloud have enabled our developers to focus more on feature development and more frequent deployments without worrying about underlying infrastructure or monitoring."

— **Abhay Kamble**
Director, Unified Commerce

Raley's – Azure Spring Cloud architecture

- Azure Spring Cloud in a VNET
- Azure Spring Cloud hosts Web Services
- Azure Spring Cloud Apps connect to Azure Postgres as a Service and on-premises resources