ArcGIS Enterprise on Kubernetes: An Introduction for Administrators

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ArcGIS Enterprise on Kubernetes Introduction and Eligibility

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ArcGIS Enterprise

ArcGIS Enterprise is the foundational system for GIS, mapping and visualization, analytics, and location-based applications. Running in customers' own infrastructure, it is software that can be used in the cloud and on-premises. It powers the full suite of applications for field data collection, analytics, operational overviews, and workforce tracking.

A challenge with managing enterprise GIS

ArcGIS Enterprise provides Scalability and High Availability…

- It’s optimized for the cloud and can run on the cloud or on-premises with cloud services.
- Esri provides tools to help you automate and install ArcGIS into your own environment.

…but this flexibility & power may increase complexity for administrators who manage deployments.

ArcGIS Enterprise: Now Cloud-Native on Kubernetes

Same product, with benefits for GIS and IT administration

A new cloud-native deployment option built from microservices, designed for large and more complex deployments, runnable on AWS, Azure, and Red Hat OpenShift.

Scalable resources

to meet unpredictable demand

High Availability

turn-key, right at deployment

plus

Increased Manageability

for large, complex deployments

ArcGIS Enterprise: Now Cloud-Native on Kubernetes

For organizations with a modern cloud strategy, run in the cloud or on-premises

Container packaging

faster, easier software delivery and a consistent installation experience

Kubernetes orchestration

distributed operating system to deploy, manage and monitor

Microservices

fine-tune resources and performance without servers or virtual machines

Getting access to ArcGIS Enterprise on Kubernetes

ArcGIS Enterprise customers with large, complex deployments

Eligibility includes:

- Esri Enterprise Agreement
- Modern Cloud Strategy incorporating Kubernetes
- Ability to stay current with ArcGIS Enterprise
- Acceptance of available capabilities at launch

Adopting Kubernetes: Now, or in the future

Considerations for a successful deployment

Modern Cloud Strategy in place

Setting up and managing a Kubernetes environment

Meet specific system requirements

Shorter, faster product life cycle just like Kubernetes itself

Enabled by streamlined upgrades for ArcGIS Enterprise on Kubernetes

Versions supported for one year before being retired

Functionality similar to a base ArcGIS Enterprise deployment

New capabilities for administrators: interface, usage metrics, and more

But some capabilities deferred, such as

- Web-tier authentication
- Some apps: Tracker, Mission, Insights, and more

ArcGIS Enterprise on Kubernetes Overview and Architecture

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This modern **microservices** architecture is geared for **Kubernetes**

Fully Automated

Distributed Computing

Scalable Storage

On-demand

ArcGIS Enterprise on Kubernetes

IS A NEW CLOUD NATIVE*

deployment option for your enterprise GIS, designed to optimize scalability, resilience and maintainability.

* ***Cloud Native*** *means our software is designed to take full advantage of the benefits of computing in the cloud.*

KEY CONCEPTS

CONTAINERS

Software Delivery

KUBERNETES

Container Orchestration

MICROSERVICES

Scalability and Resiliency

Containers and Registry

- Packaging of code and configuration files as immutable images
  - Built via modern CI/CD pipelines
  - Automatable
  - Repeatable
- Distribution via Container Registry
  - Releases and patches
  - Mirrored or replicated

Container Orchestration: Kubernetes

- Manages containerized applications across a cluster of computers
- Google initiated, open-source
- New distributed operating system for applications
- Cloud, On-premises, Edge, …
- Strives to achieve user-defined Desired State

Kubernetes Architecture

Containers are downloaded from Container Registry

Pod is an instance of a running container

Kubernetes process called 'kubelet' runs on every node

File volumes can be attached to a pod called Persistent Volumes

Application 3 Pod (pv)
Application 2 Pod
Application 1 Pod
Node

Application 2 Pod
Application 1 Pod
Node

Application 3 Pod (pv)
Application 2 Pod
Node

Worker Pool

Clusters can be made up of thousands of computers, managed automatically to run containerized applications

Also called Kubernetes Master

Control Plane (Provider Managed)

Controller

etcd

API Server

Kubectl/APIs/Dashboard

Kubernetes Cluster

Microservices

- Architectural style that's
  - Highly maintainable and testable
  - Loosely coupled
  - Independently deployable
  - Organized around business capabilities
  - Owned by a small team

- Enables
  - Rapid, frequent and reliable delivery of large, complex applications

While ArcGIS was always made up of REST APIs for GeoServices and Administration, with Enterprise on Kubernetes, we are now truly deploying them as loosely coupled processes that are individually manageable and scalable!

Cloud Native Architecture

Cloud native computing is an approach in software development that utilizes cloud computing to "build and run scalable applications in modern, dynamic environments such as public, private, and hybrid clouds".[1] Technologies such as containers, microservices, serverless functions and immutable infrastructure, deployed via declarative code are common elements of this architectural style.[2][3]

These techniques enable loosely coupled systems that are resilient, manageable, and observable. Combined with robust automation, they allow engineers to make high-impact changes frequently and predictably with minimal toil.

Frequently, cloud-native applications are built as a set of microservices that run in Docker containers, and may be orchestrated in Kubernetes and managed and deployed using DevOps and Git CI workflows[4] (although there is a large amount of competing open source that supports cloud-native development). The advantage of using Docker containers is the ability to package all software needed to execute into one executable package. The container runs in a virtualized environment, which isolates the contained application from its environment.[2]

Sources: CNCF, VMWare, Dilbert

Achieving Cloud Native

- Cloud Native is a pattern with many ways to implement
- Applications taking advantage of cloud services/capabilities
  - Elasticity
  - Various managed service like Databases, Queues, Compute Engines, etc.
- Enterprise on Kubernetes aims to be cloud native by using cloud-managed services wherever possible

Our cloud native journey continues to improve with subsequent releases!

DEPLOY – CONFIGURE – USE

Architecture

MINIMIZING DOWNTIME

When Patching and Upgrading to Newer Version

UPDATING SOFTWARE | PATCHES & NEW VERSIONS

Rolling or Ramped Update

Blue-Green Update

ArcGIS Enterprise on Kubernetes

is cloud made from the ground up

Azure SQL Database

Microsoft

Azure Database for PostgreSQL

Azure

AKS

Azure ALB

Azure Blobs

Azure Files

Azure Disk

Amazon Aurora PostgreSQL

Amazon RDS for PostgreSQL

Amazon

Amazon RDS for SQL Server

AWS ELB

AWS

EKS

Amazon S3

Amazon EFS

Amazon EBS

Routes

MinIO

IBM Red Hat

OpenShift

Oracle

SAP HANA

PostgreSQL

Microsoft SQL Server

IBM DB2

Google

GCP*

GKE

Provisioning ArcGIS Enterprise on any cloud,
with infrastructure as code pattern

ArcGIS Enterprise on Kubernetes Cloud Provisioning

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Demonstration: Cloud Provisioning

Subrat Bora

ArcGIS Enterprise on Kubernetes Deployment & Configuration

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The Three-Step Model

Demonstration: Deployment

Markus Walker

ArcGIS Enterprise on Kubernetes Documentation

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ArcGIS Enterprise on Kubernetes documentation resources

ArcGIS Enterprise on Kubernetes – **NEW**!

ArcGIS Enterprise documentation resources

ArcGIS Enterprise on Kubernetes – **NEW**!

ArcGIS Enterprise on Windows and Linux

Discovery paths

Discovery paths

Experience what's possible with curated collections of hands-on tutorials.

Mapping and visualization

Learn mapping and visualization basics in ArcGIS Enterprise on Kubernetes.

Start this path

Discovery paths

Get started with ArcGIS Enterprise

Create and share an evacuation map to prepare for an incoming hurricane.

45 min

Lesson

Track crime patterns to aid law enforcement

Help the Lincoln Police Department allocate resources to combat crime.

45 min

Lesson

Get started with ArcGIS StoryMaps

Build a story map about a scientific expedition to a Guatemalan volcano.

30 min

Lesson

How to smart map: Color and size

Use color and size to show relationships in your data.

15 min

Story map

Blogs

What is ArcGIS Enterprise on Kubernetes

Learn about this new ArcGIS Enterprise deployment option, a cloud-native architecture optimized for scalability, resilience, and manageability.

Read this article

Determine whether Kubernetes is right for you

Find out about eligibility and system requirements, and more.

Read this article

Frequently asked questions

Find answers to some of the most commonly asked questions about ArcGIS Enterprise on Kubernetes.

Read this article

Videos

Deploy – Configure - Use

Learn how to deploy a production-ready and highly available cloud-native geospatial infrastructure for your enterprise organization.

Watch video

Operate and scale

Learn how federation, automated maintenance, and operations and scaling work within ArcGIS Enterprise on Kubernetes.

Watch video

Documentation

Documentation

Find answers and information so you can complete your projects.

- What is ArcGIS Enterprise on Kubernetes
- Plan
- Deploy ArcGIS Enterprise on Kubernetes
- Secure and control
- Manage data
- Map and visualize
- Share and collaborate
- Analyze and discover

ArcGIS Enterprise on Kubernetes Scope Available and Resources

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Capabilities available at the 10.9 release *(illustrative)*

Deployment & Upgrading

Interactive or silent-mode deployment
Upgrades via interface or Administrator API
Architecture profiles for High Availability

Deferred: Support for disconnected environments

Administration & Security

Health Monitoring
Scaling services via interface or API
Backup and Restore
SAML, OpenID, LDAP, WAD
Enterprise groups and users

Deferred: Web-tier authentication (IWA+PKI)

Data Management

SQL Server and PostgreSQL
Folders and enterprise geodatabases
Distributed collaboration (excluding two-way editing)

Deferred: Oracle or SAP Hana data sources

Creating & Sharing Content

Publishing map, feature, and geocoding services; map, tile, and scene tile packages, and hosted feature layers
Spatial analysis
Routing capabilities (with federated server)

Deferred: Utility Network, Parcel Fabric, Workflow Manager user type extensions

Server Federation

Federate an ArcGIS GIS Server or ArcGIS Image Server (excluding raster analytics)

Deferred: Federating ArcGIS GeoAnalytics Server, GeoEvent Server, Notebook Server, Workflow Manager Server

Applications included: ArcGIS CityEngine, ArcGIS Dashboard ArcGIS Enterprise Sites, ArcGIS Experience Builder, ArcGIS Field Maps, ArcGIS QuickCapture, ArcGIS StoryMaps, ArcGIS Web AppBuilder, ArcGIS Workforce

Deferred: ArcGIS Business Analyst Enterprise, ArcGIS Indoors and Space Planner, ArcGIS Insights, ArcGIS Living Atlas of the World, ArcGIS Mission, ArcGIS Ortho Maker, ArcGIS Tracker, ArcGIS Workflow Manager

Resources: Learning More

Please talk to your Esri representative, if you have questions.

Kubernetes Resources from Esri

- 10.9 Blogs
- Product Documentation
- Demonstrations

Also check with cloud providers; many offer Kubernetes training!

AWS, Azure, IBM/RedHat and others offer courses or learning environments
Kubernetes documentation http://kubernetes.io/docs/home
Cloud Native Computing Foundation: http://cncf.io

User Conference 2021

- Three sessions on Kubernetes:
  - Introduction for Administrators, Monday 12-Jul-2021
  - Operations and Management, Tuesday 13-Jul-2021
  - Publishing and Tuning, Wednesday 14-Jul-2021
- ArcGIS Enterprise: The Road Ahead, Tuesday 13-Jul-2021

Support Page for ArcGIS Enterprise on Kubernetes
https://support.esri.com/en/Products/Enterprise/

Resources Page

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