ArcGIS Enterprise on Kubernetes Technical Concepts

Gayathri Vijay
Garima Tiwari
Caroline Wright
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Jeff Smith
Laurence Clinton
Jon Quinn

2021 ESRI DEVELOPER SUMMIT

In this session we will cover…

- Technical Concepts related to ArcGIS Enterprise on Kubernetes
- Publishing GIS Map, Feature, and Tile Services
- Federation with ArcGIS Server
- Services Management and Tuning
- Security and Authentication
- High Availability and Disaster Recovery
- API Overview

Publishing Services in ArcGIS Enterprise on Kubernetes

Gayathri Vijay

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Publishing Services in ArcGIS Enterprise on Kubernetes

- Map Services
- Hosted Feature Services
- Bulk Publishing

Map Services in ArcGIS Enterprise on Kubernetes

- Map services can be published by copying all data
- Register user-managed data stores to portal and publish map services referencing the data
- Supported user-managed database data stores
  - SQLServer
  - Postgres
- Map services can be published using either shared or dedicated instance

Map Services in ArcGIS Enterprise on Kubernetes

- Overwriting of map services from ArcGIS Pro
- Map service extensions
  - Feature Access
  - WMS
  - WFS
  - Network Analysis
  - KML

Demo

Publish map service + feature access, referencing registered data from ArcGIS Pro

Hosted Feature Services in ArcGIS Enterprise on Kubernetes

- Publish hosted feature services from ArcGIS Pro and from Portal
- Supports overwriting of hosted feature services from Portal and ArcGIS Pro
- Export to different formats (fgdb, shp, csv, excel, etc.) from hosted feature service

Demo

Publish hosted feature service from Portal

Bulk Publishing in ArcGIS Enterprise on Kubernetes

- Register user-managed database data store to Portal
- Create feature layers in bulk from datasets in a user-managed database data store

Demo

Create layers in bulk from the registered database data store

Summary

- Publishing of services in ArcGIS Enterprise on Kubernetes is the same as publishing services in ArcGIS Enterprise on Windows/Linux
- Users can access and use these published services just like they would use a service in ArcGIS Enterprise on Windows/Linux

Tile Layers in ArcGIS Enterprise on Kubernetes

Garima Tiwari

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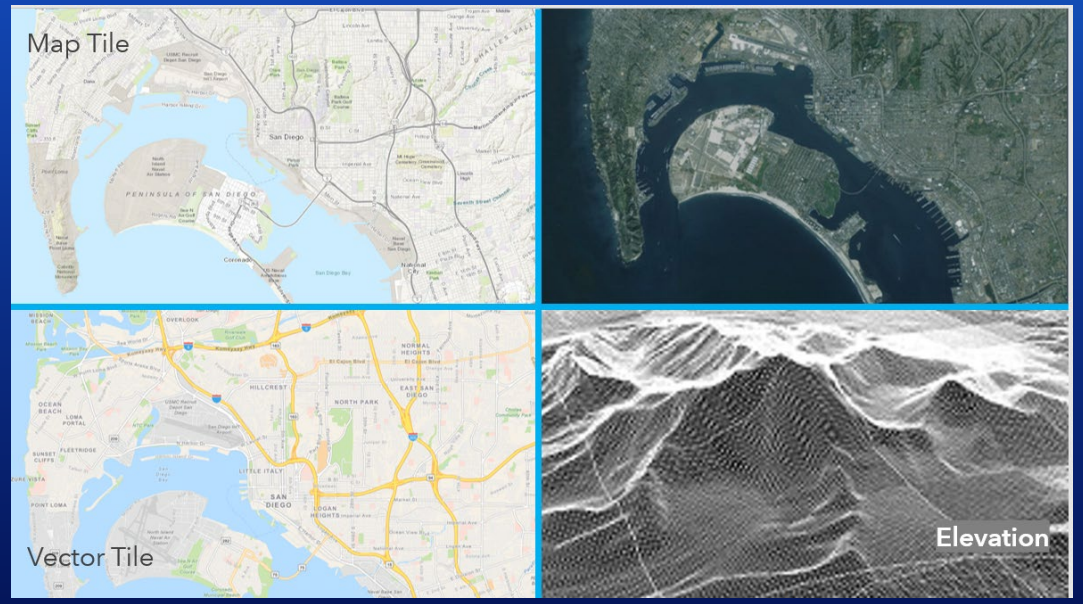
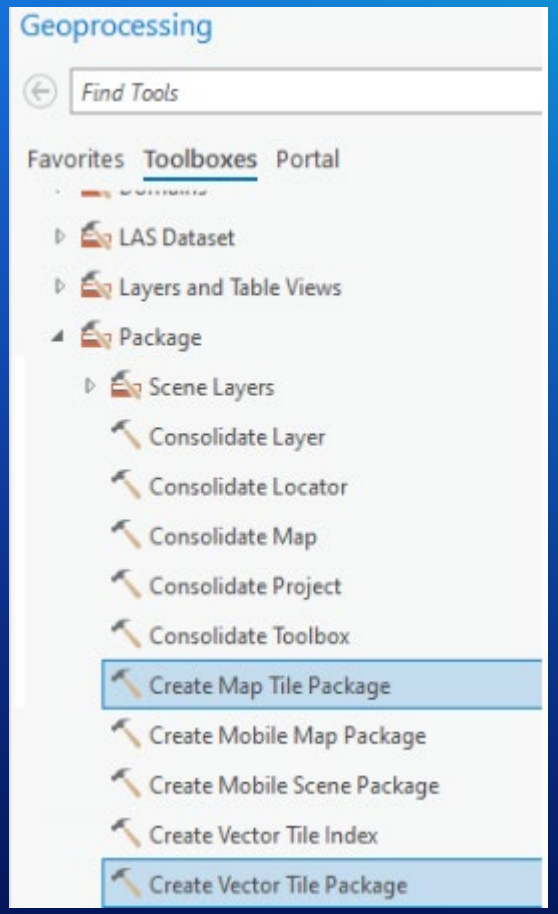
Caching for fast visualization

Using ArcGIS Pro Pre-cook cache

- Map with vector content as vector tile packages (.vtpk)
- Map, Image, Elevation content as tile packages (.tpkx)





Summary: Hosted Tile layers

- **As a publisher:**
  - **Same user experience for ArcGIS Enterprise on Windows, Linux and Kubernetes**

- **As a administrator:**

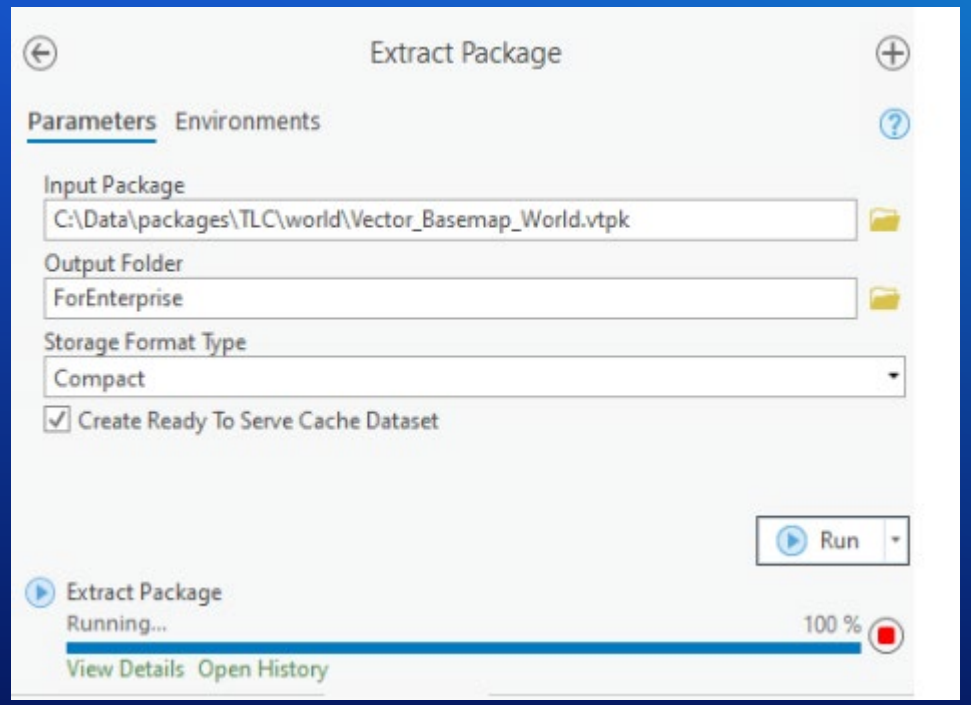
Windows/ Linux	Kubernetes
Portal content	Sharing (portal services)
ArcGIS cache directory	System managed object store

Tile and Scene Layers

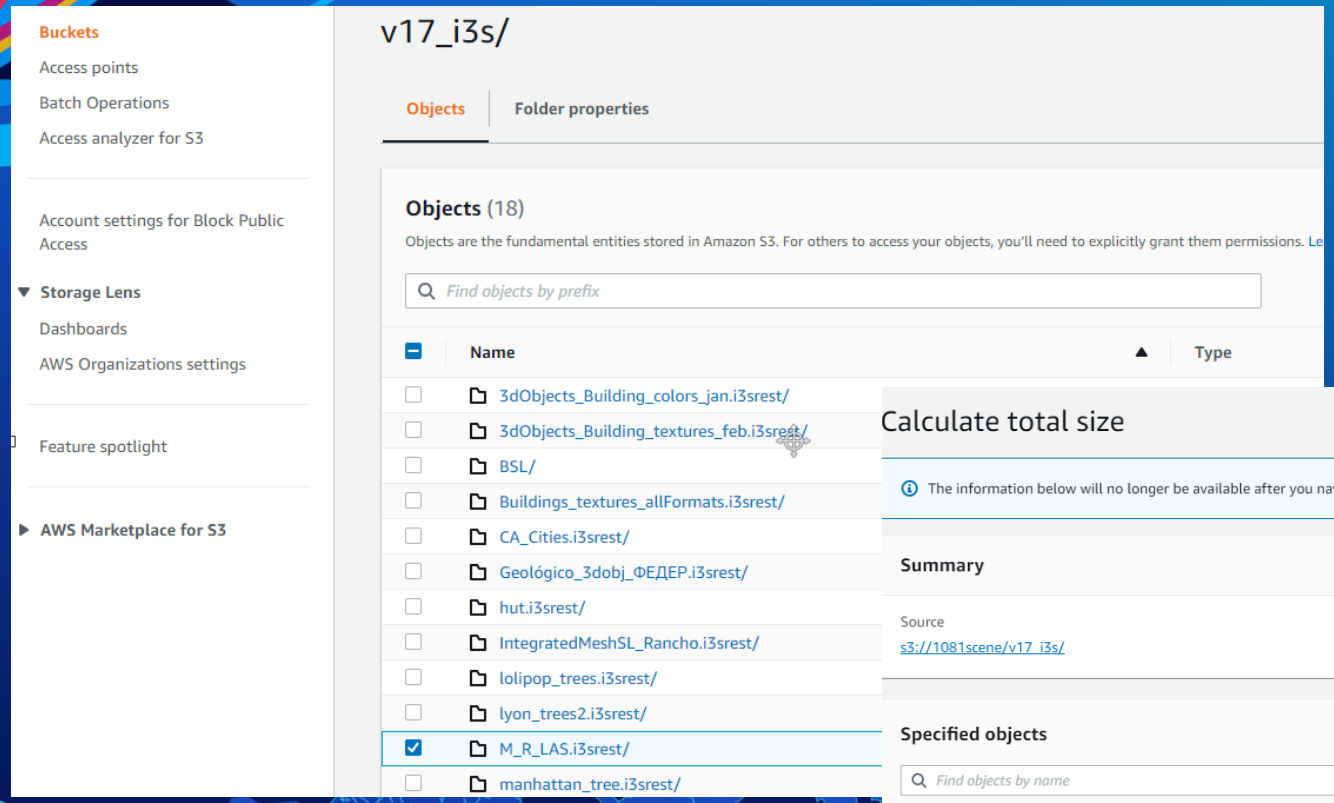
Referencing tile content in folder or cloud data stores

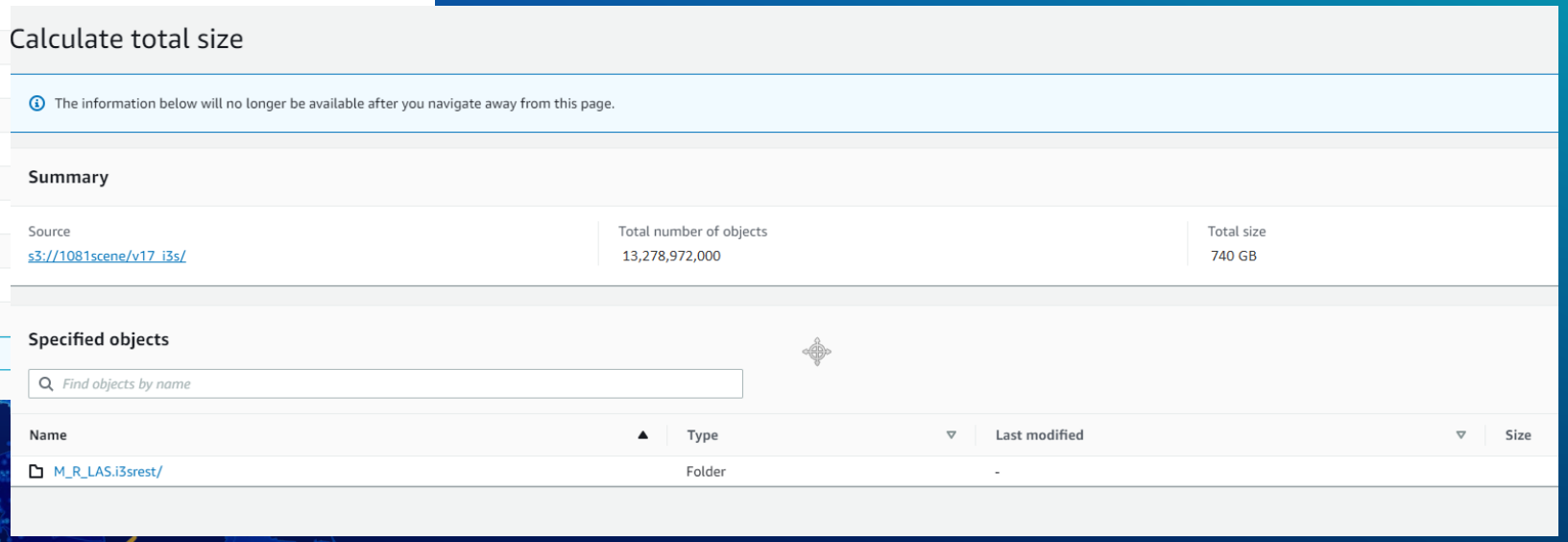
Creating ready to serve tile content

- In ArcGIS Pro:
  - Open Extract package gp tool
  - Browse to existing tile/vector or scene package
  - For Output Folder :
    - File System or
    - Object store (AWS S3 or Azure blob store)
  - Enable “create ready to serve cache dataset”



Demo


Buckets
Access points
Batch Operations
Access analyzer for S3
Account settings for Block Public Access
Storage Lens
Dashboards
AWS Organizations settings
Feature spotlight
AWS Marketplace for S3
v17_i3s/
Objects
Folder properties
Objects (18)
Objects are the fundamental entities stored in Amazon S3. For others to access your objects, you'll need to explicitly grant them permissions.
Find objects by prefix
Name
Type
3dObjects_Building_colors_jan.i3srest/
3dObjects_Building_textures_feb.i3srest/
BSL/
Buildings_textures_allFormats.i3srest/
CA_Cities.i3srest/
Geológico_3dobj_ФЕДЕР.i3srest/
hut.i3srest/
IntegratedMeshSL_Rancho.i3srest/
lolipop_trees.i3srest/
lyon_trees2.i3srest/
M_R_LAS.i3srest/
manhattan_tree.i3srest/


Calculate total size
The information below will no longer be available after you navigate away from this page.
Summary
Source
s3://1081scene/v17_i3s/
Total number of objects
13,278,972,000
Total size
740 GB
Specified objects
Find objects by name
Name
Type
Last modified
Size
M_R_LAS.i3srest/
Folder
-

Summary

Tile layers referencing content in folder or cloud data stores

+ Ideal for publishing large vector/tile/scene content
+ No restraint on your ArcGIS Enterprise disk or volume resources
+ Supports data resiliency and high availability as configured in the object store
+ Tile content served directly from the file system / object store

Federation with a standalone ArcGIS Server

Caroline Wright

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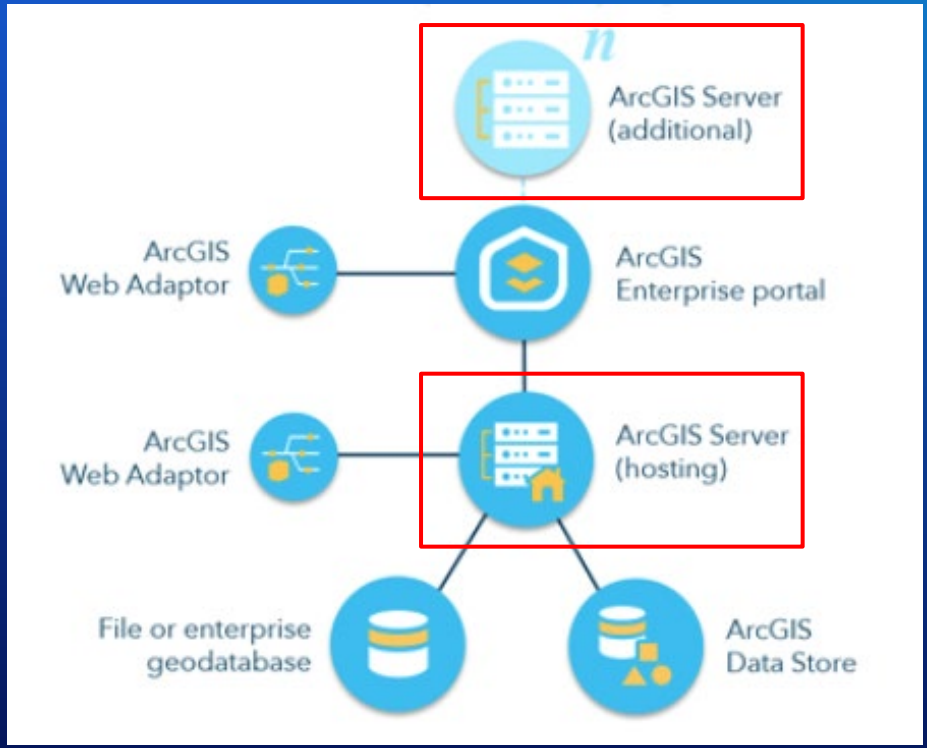
What is federation?

- Links an ArcGIS Server site with an ArcGIS Enterprise Portal
- Automatically shares the server site's content with the ArcGIS Enterprise
- Portal given control of the server site's security

- In ArcGIS Enterprise on Kubernetes, federation is an optional process

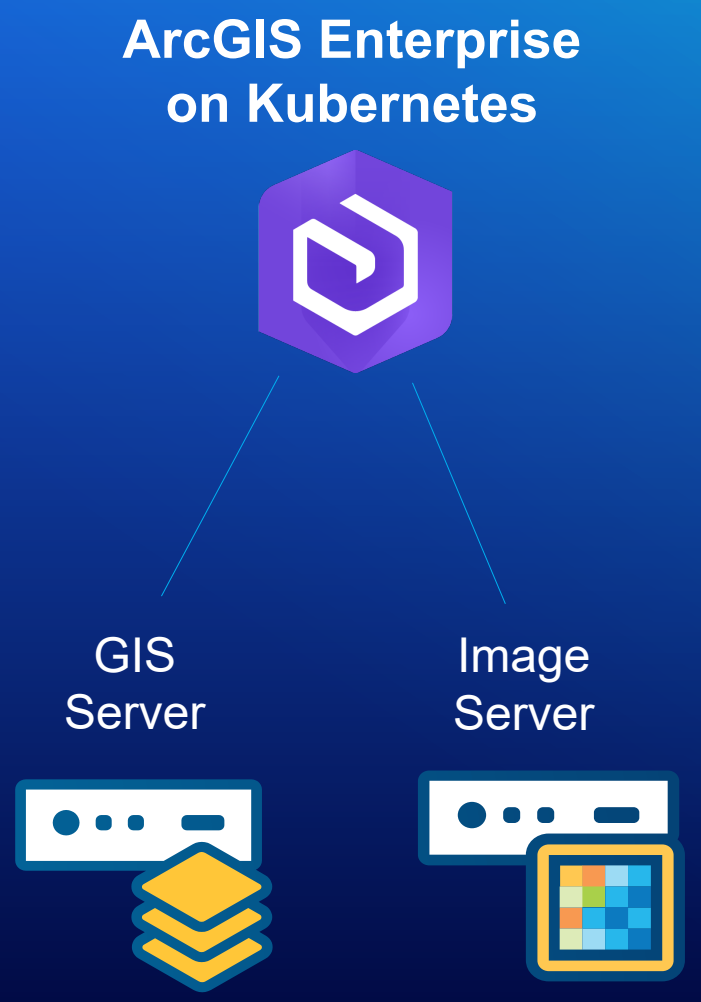


Federation support – versions and server roles

- ArcGIS Server version 10.5 or higher
- Server licensed roles
  - ArcGIS GIS Server – Advanced and Standard editions
  - ArcGIS Image Server (excluding raster analytics)

Federation support – configure server roles

- No need to configure a hosting server for publishing hosted layers
  - Included in base ArcGIS Enterprise on Kubernetes deployment
- Image hosting and feature analysis services are set automatically
- Note, ensure your federated server uses a CA-signed certificate.



Demo

Federating a standalone ArcGIS Server

Service Management and Tuning with ArcGIS Enterprise for Kubernetes

Moginraj Mohandas

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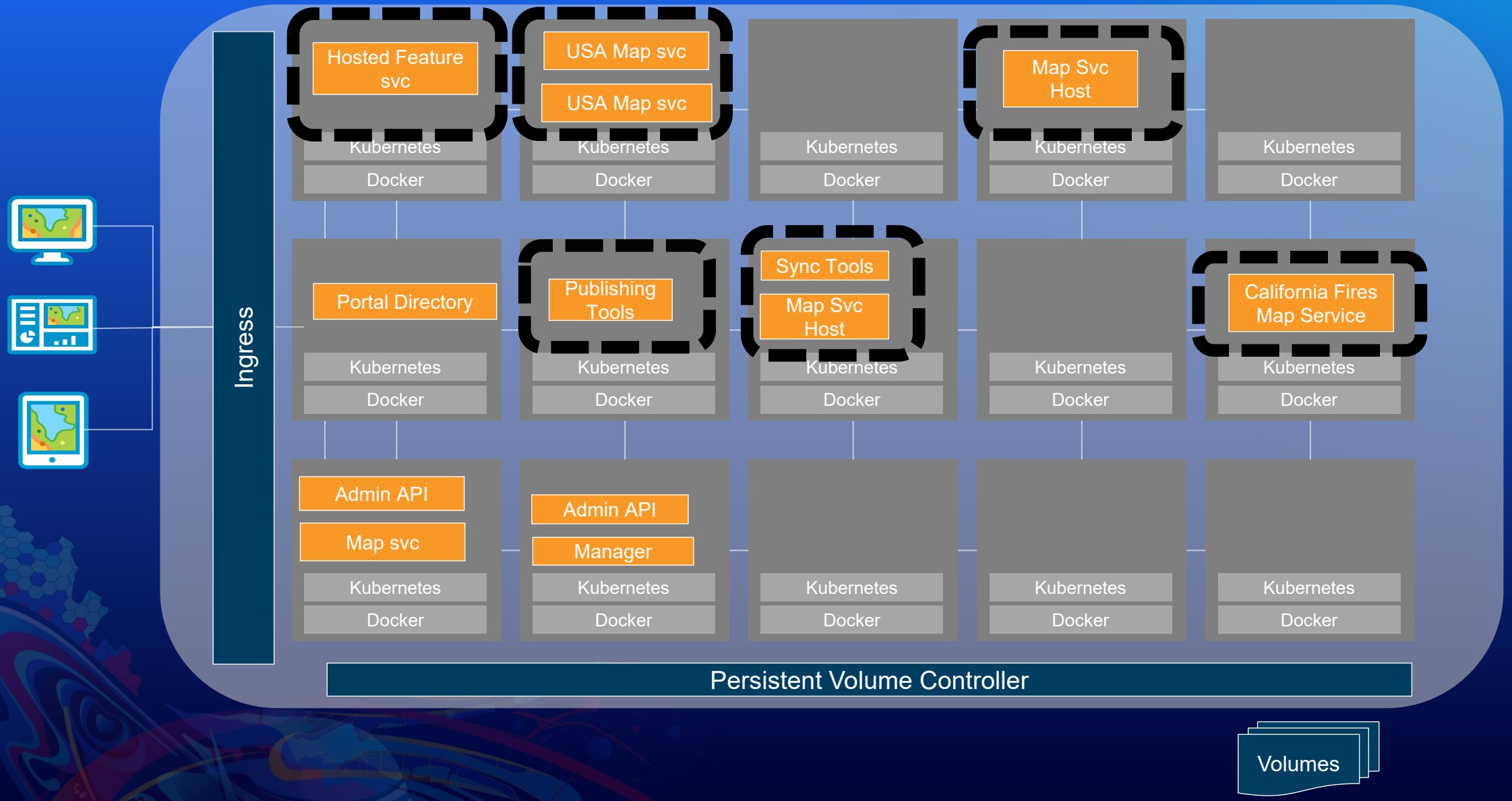
ArcGIS Enterprise Manager – service management

- **Services**
  - Services power your geospatial capabilities
  - Different types – Map, Feature service, GeoProcessing…
  - Running inside pods – quick, scalable, isolated
    - Dedicated services run on dedicated pods
    - Shared services run on shared pods

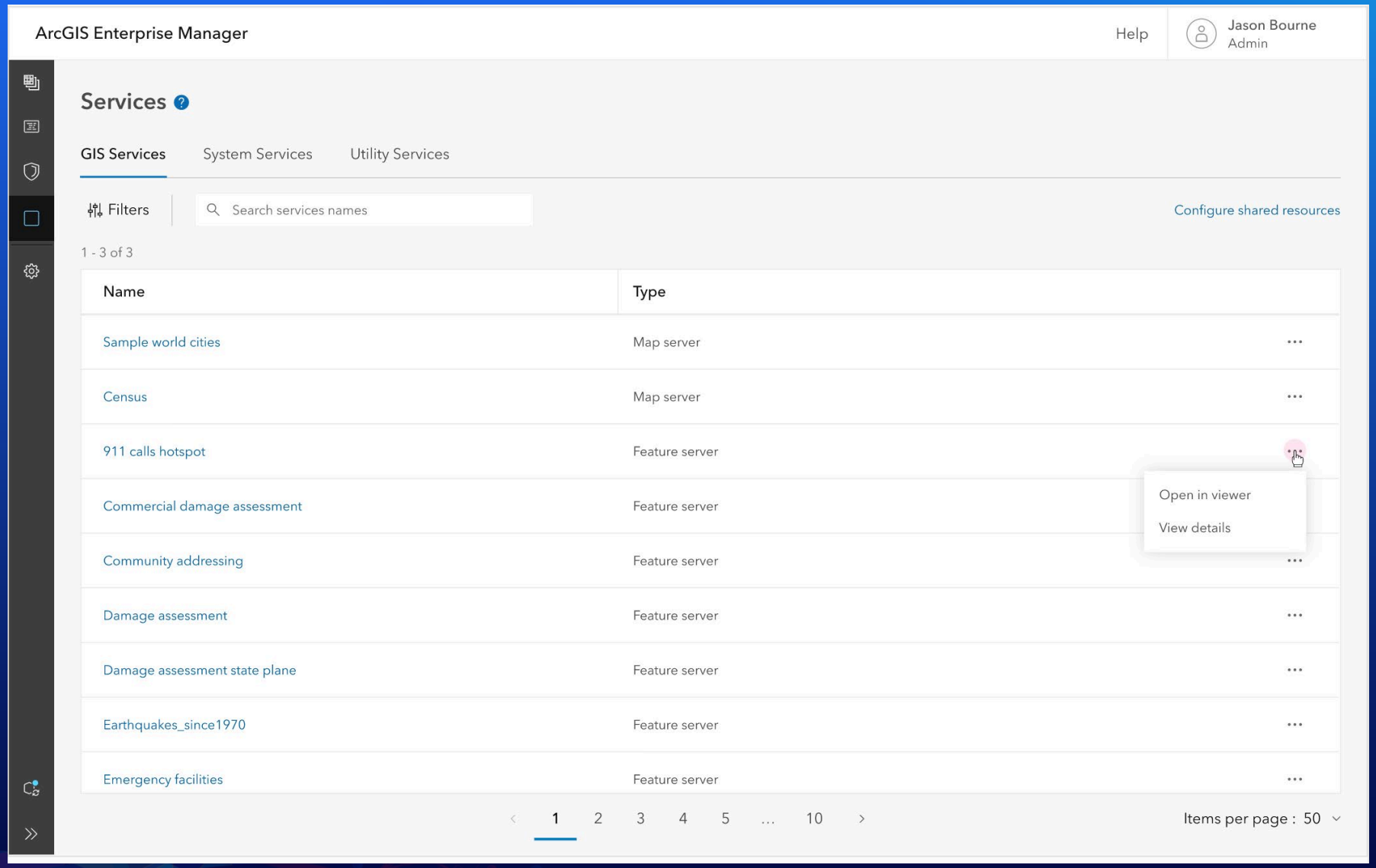
ArcGIS Enterprise Manager – service management



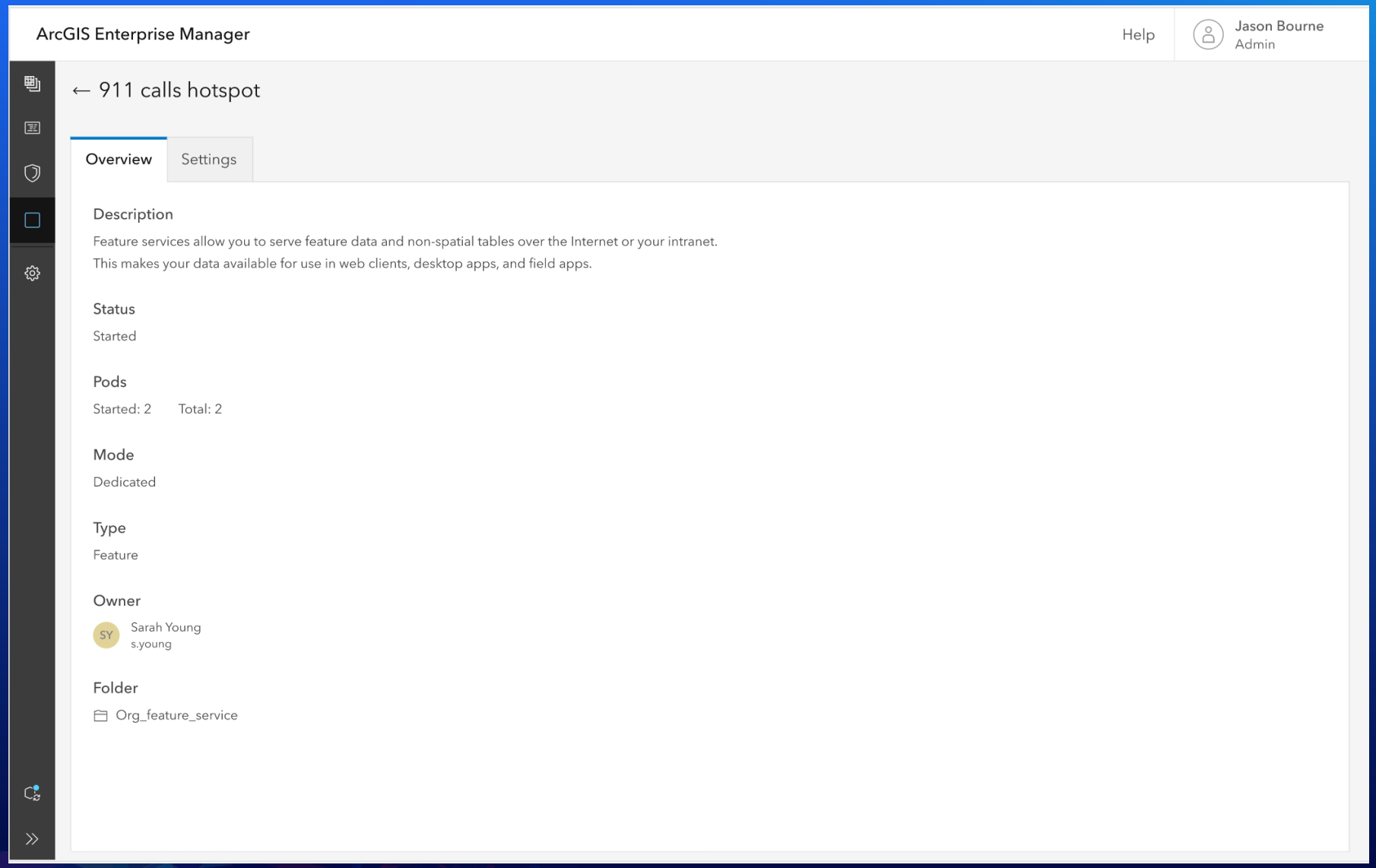
ArcGIS Enterprise Manager – service management

- Service Tuning/Scaling
  - Depending on usage and demand, tune services
  - Scale horizontally by upping the number of pods for a service
    - Dedicated -> Scale out the specific pods for a service
    - Shared -> Scale out the shared pods, think about moving to dedicated
  - Update resources for pods – Memory/CPU
  - Add more resources to the cluster as necessary(nodes)

ArcGIS Enterprise Manager – service management



ArcGIS Enterprise Manager – service management



ArcGIS Enterprise Manager – service management

ArcGIS Enterprise Manager

Help

Jason Bourne
Admin

← 911 calls hotspot

Overview | Settings

Status

Started

Stop service

Mode

- (•) Dedicated
- ( ) Shared

Scaling

Number of pods: 2

Resource limits

Minimum CPU: 0.125

Maximum CPU: 1

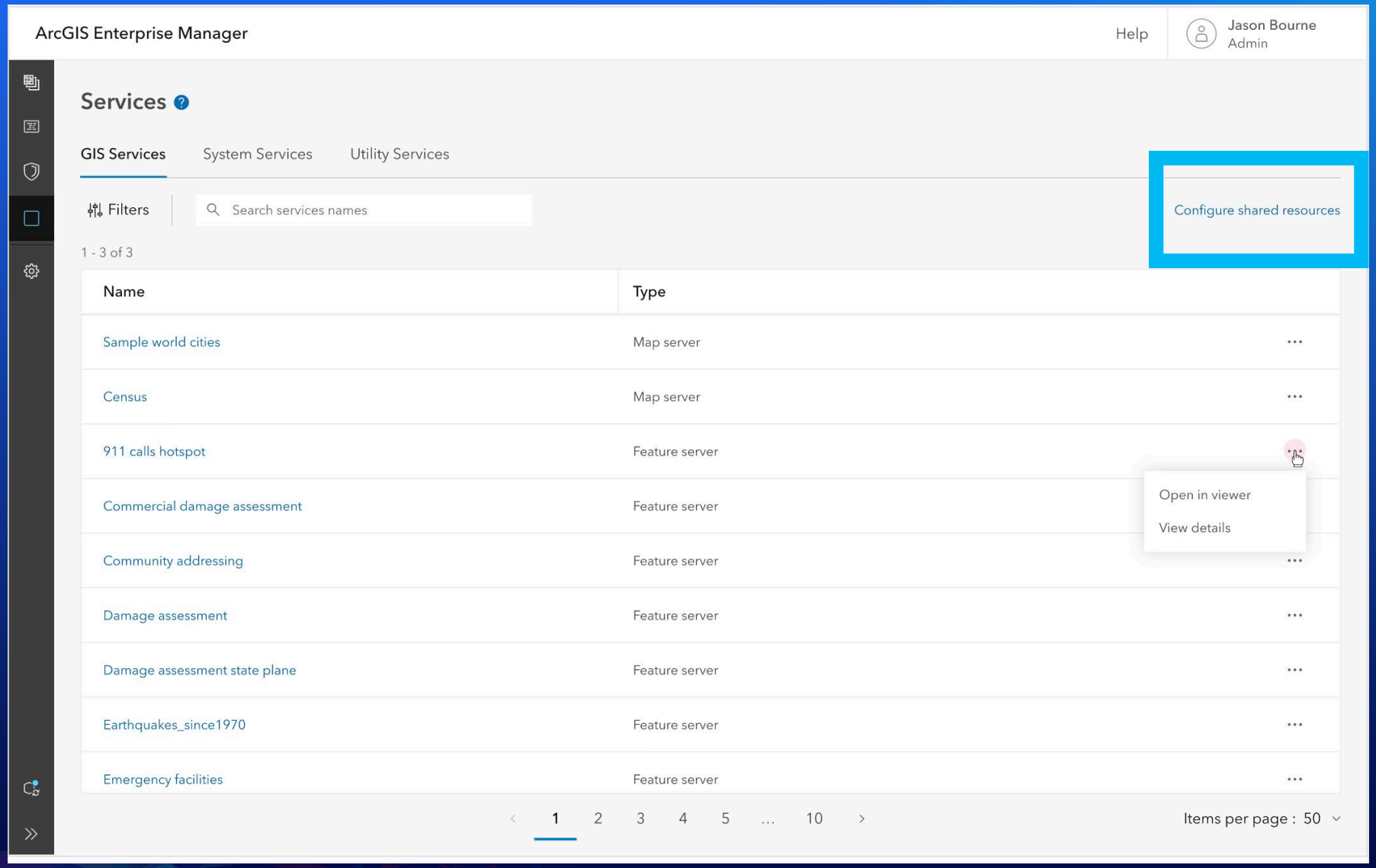
Minimum memory (GiB): 2

Maximum memory (GiB): 16

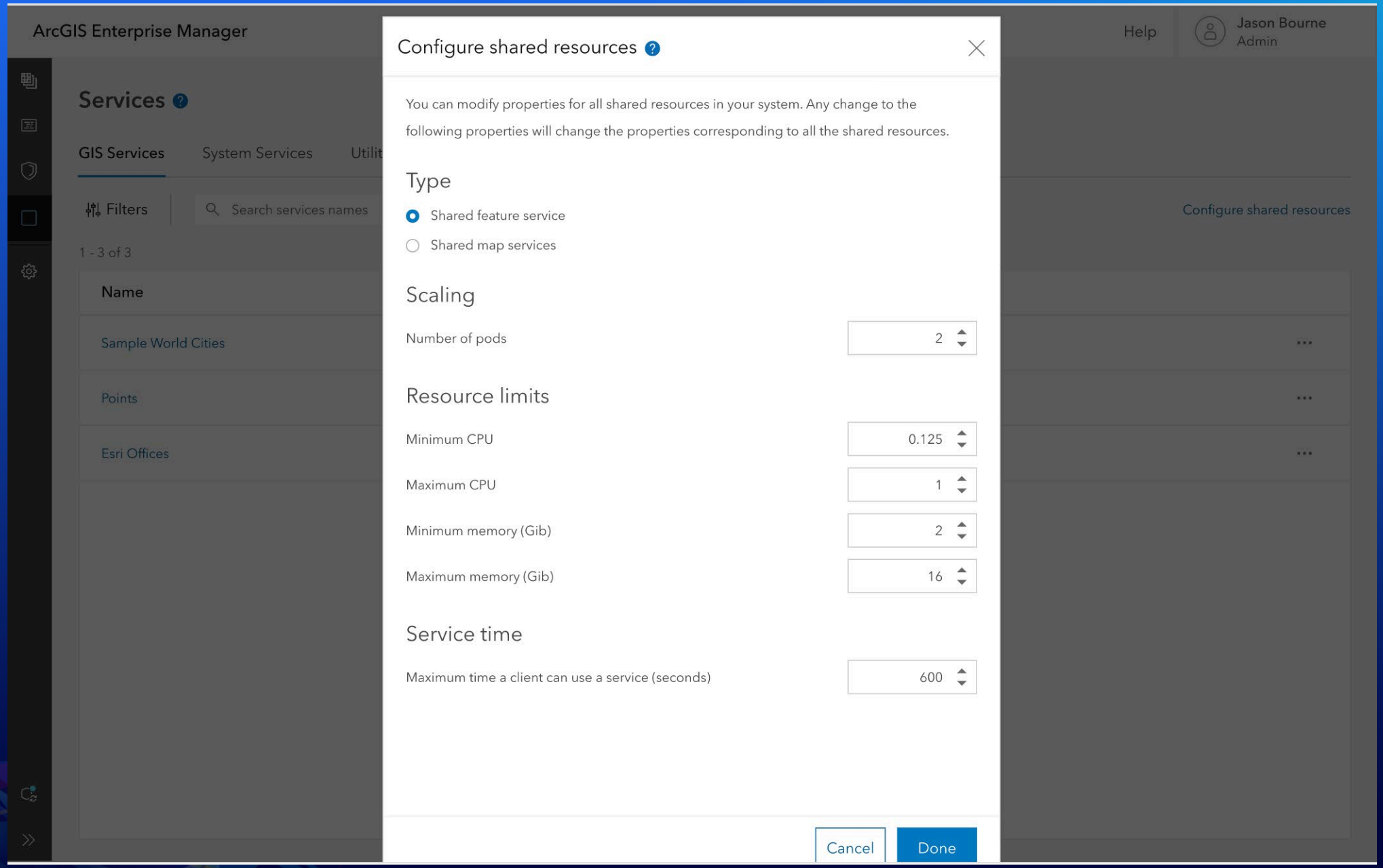
Service time

Maximum time a client can use a service (Seconds): 600

ArcGIS Enterprise Manager – service management



ArcGIS Enterprise Manager – service management



Security and Authentication

Jeff Smith

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TLS Certificates

ArcGIS Enterprise on Kubernetes

TLS Certificates

- Identity Certificates
  - Used to identify and prove the ownership of a server or other resource
  - Previously referred to as a server certificates
  - Typically imported as a .pfx file
  - On Kubernetes, one will be assigned to the Ingress controller

- Trust Certificates
  - Contains information about a certificate issuer or certificate authority
  - Used to validate identity certificates from external resources
  - Previously referred to as a root or intermediate certificates
  - Typically imported as a .cer or .crt file

TLS Certificates

- What has changed?
  - Importing an identity certificate during the deployment process
  - Manage certificate through Enterprise Manager

```
------------------------------------------------------------------------
TLS CERTIFICATE

All communications to ArcGIS Enterprise are encrypted and use Transport Layer
Security (TLS). A TLS certificate signed by your Certification Authority (CA)
is required for the ingress controller to enable encrypted communication. If
you do not have a trusted CA-signed certificate, the deployment process
will generate a self-signed certificate for you. Self-signed certificates
are not recommended for production environments.
------------------------------------------------------------------------

    Choose one of the following options to apply a TLS certificate for
    Ingress traffic:

        1 - Use an existing TLS secret that contains a private key and a certificate
        2 - Use a .pfx file that contains the private key and certificate
        3 - Use PEM format private Key (.key file) and certificate (.crt file)
        4 - Generate a self-signed certificate
```

Demo

Certificate Management through Enterprise Manager

Authentication

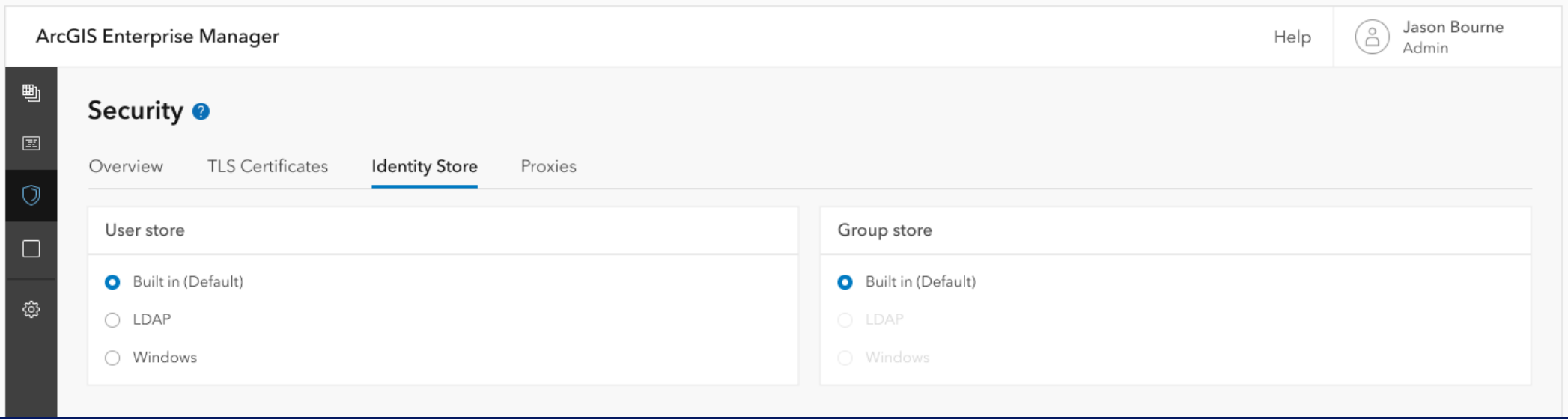
ArcGIS Enterprise on Kubernetes

Authentication

- Supported authentication methods are the same as Enterprise on Windows and Linux
  - Built-in
  - SAML
  - OpenID Connect
  - Portal-tier
  - Web-tier
- Portal-tier and web-tier authentication fully supported for both Active Directory and LDAP users

Configuring Built-in, Active Directory, and LDAP Identity Stores

- **Configuration handled through Enterprise Manager!**



Configuring LDAP Identity Stores

Security

Overview TLS Certificates Iden

User store

Built in (Default)

LDAP

Windows

User store & Group store configu

User store

Type

LDAP

LDAPS

Hostname (Required)

Port (Required)

Hostname (Required)

Port (Required)

Ldap URL for users

Username (Required)

Format: distinguished name (example: uid=username

Password (Required)

Case sensitive

True

False

User first name attribute (Required)

Password (Required)

Case sensitive

True

False

User first name attribute (Required)

User last name attribute (Required)

User email attribute (Required)

Username attribute (Required)

User search attribute

Configuring Web-tier Authentication

- Web adaptor not part of a standard installation
  - Only required when using web-tier authentication
- Support for both types of web adaptors
  - IIS web adaptor
  - Java web adaptor

High Availability and Disaster Recovery in ArcGIS Enterprise on Kubernetes

Jon Quinn and Laurence Clinton

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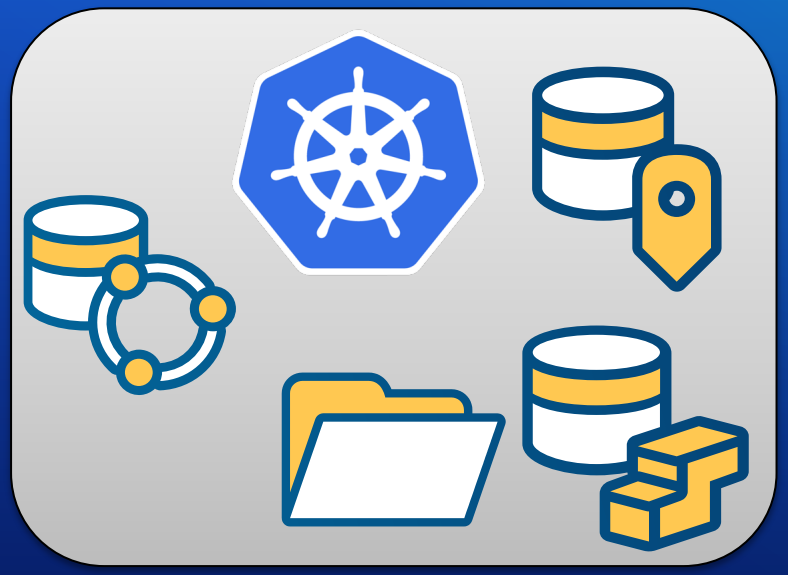
Overview

- Backup and Restore
  - What is included
  - Where is it stored
- High Availability
  - Kubernetes pod lifecycles and probes
  - Architecture profiles
  - Failure scenarios

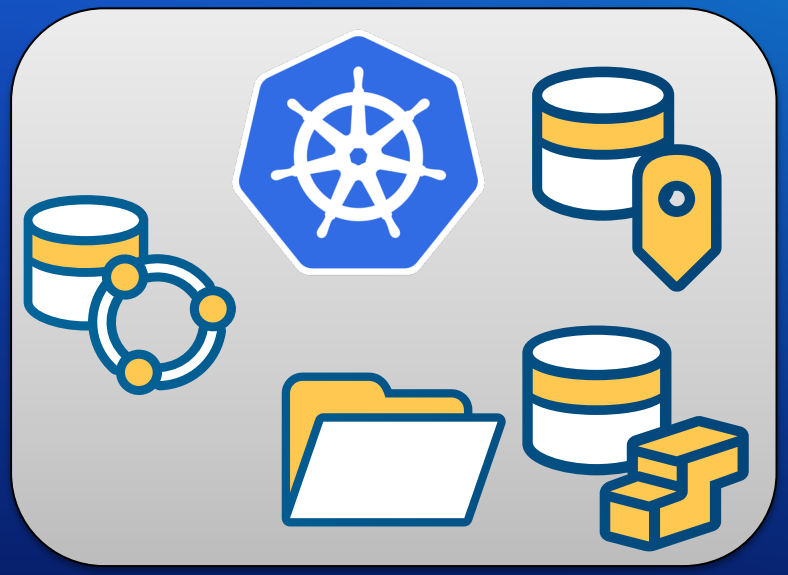
ArcGIS Enterprise Backups

- Backups are integral to minimizing data loss after a disaster or outage
- Integrated within ArcGIS Enterprise as opposed to an external, client-type tool



What is included in a backup?

- Customer data
  - Content and services
  - Groups, users, and other metadata
  - Map and tile cache
- Configuration information
  - Organization settings
  - Server type configuration
- Kubernetes infrastructure objects



Where is it stored?

- Supported by a persistent volume
  - Hosted backup store
  - File system
- Native cloud storage

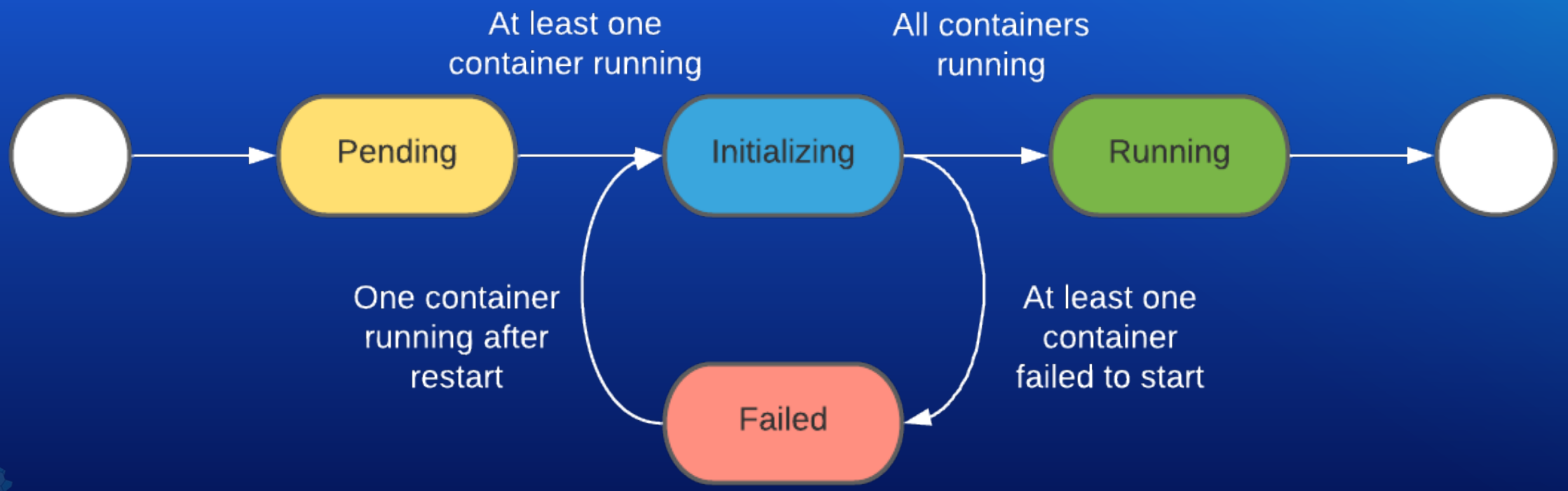
What happens during a restore?

- Kubernetes infrastructure objects restored
- Configuration data restored
- User data restored

Process:

1. Deploy ArcGIS Enterprise
2. Define backup store
3. Restore backup

Kubernetes Pod Lifecycles



Kubernetes Probes

- Liveness probes
  - Did all containers start correctly?
- Readiness probes
  - Are all containers ready to access requests?

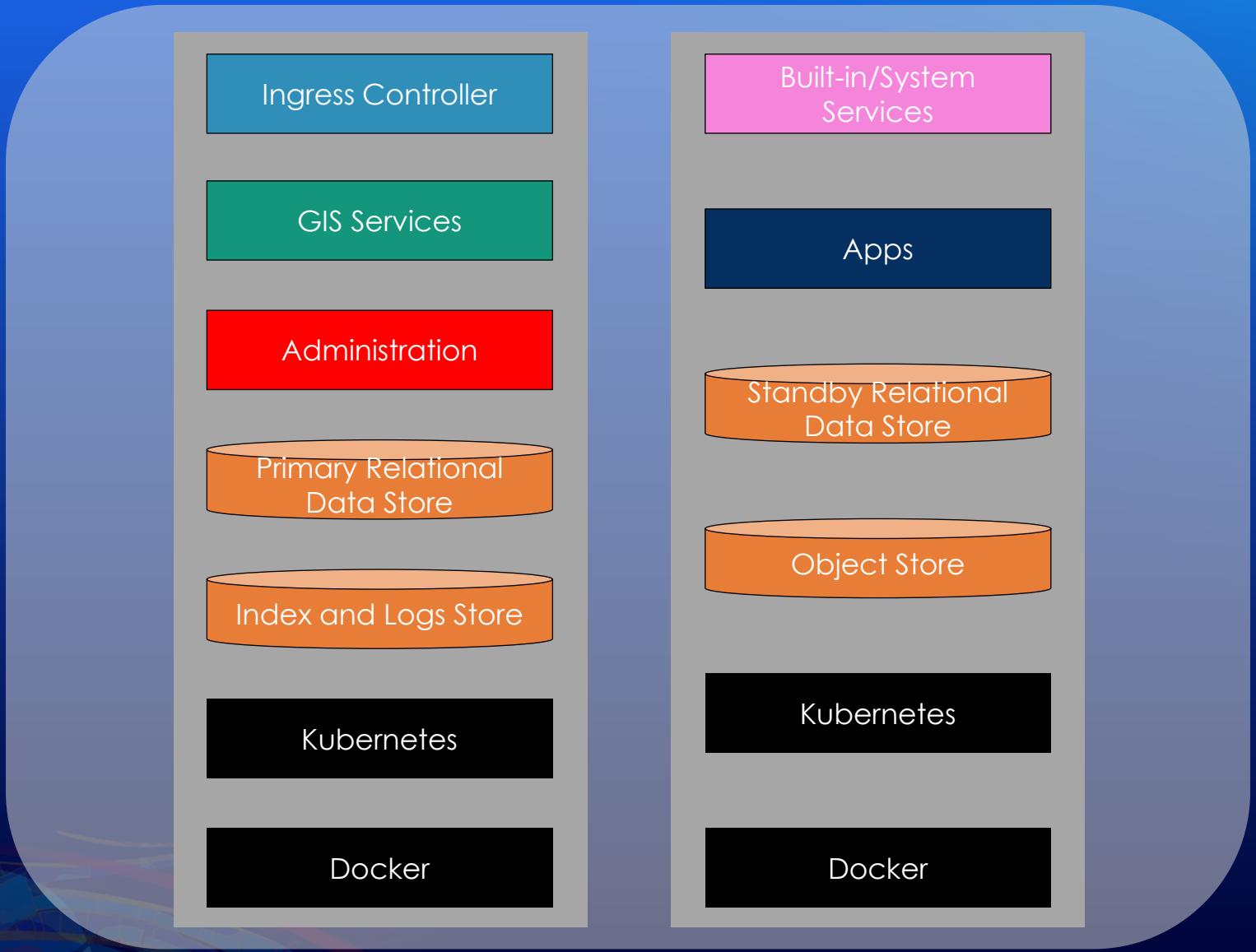
Architecture Profiles

- One size does not fit all
- Support for different profiles that match an organizations needs

Development

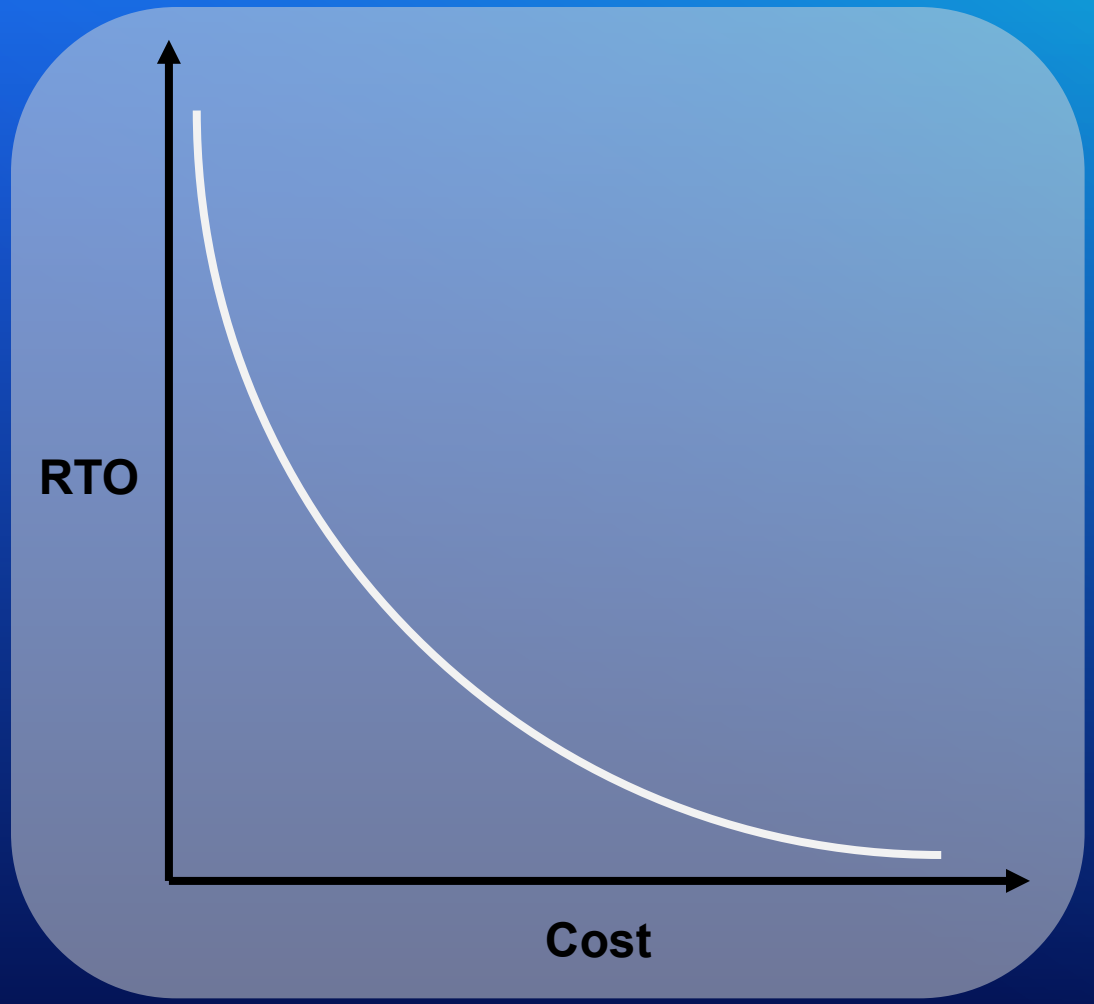
- Non-production
- Easy to deploy
- No mandate for high availability or achieving a specific SLA
- Moderate tolerance for downtime

Development



High Availability Profiles

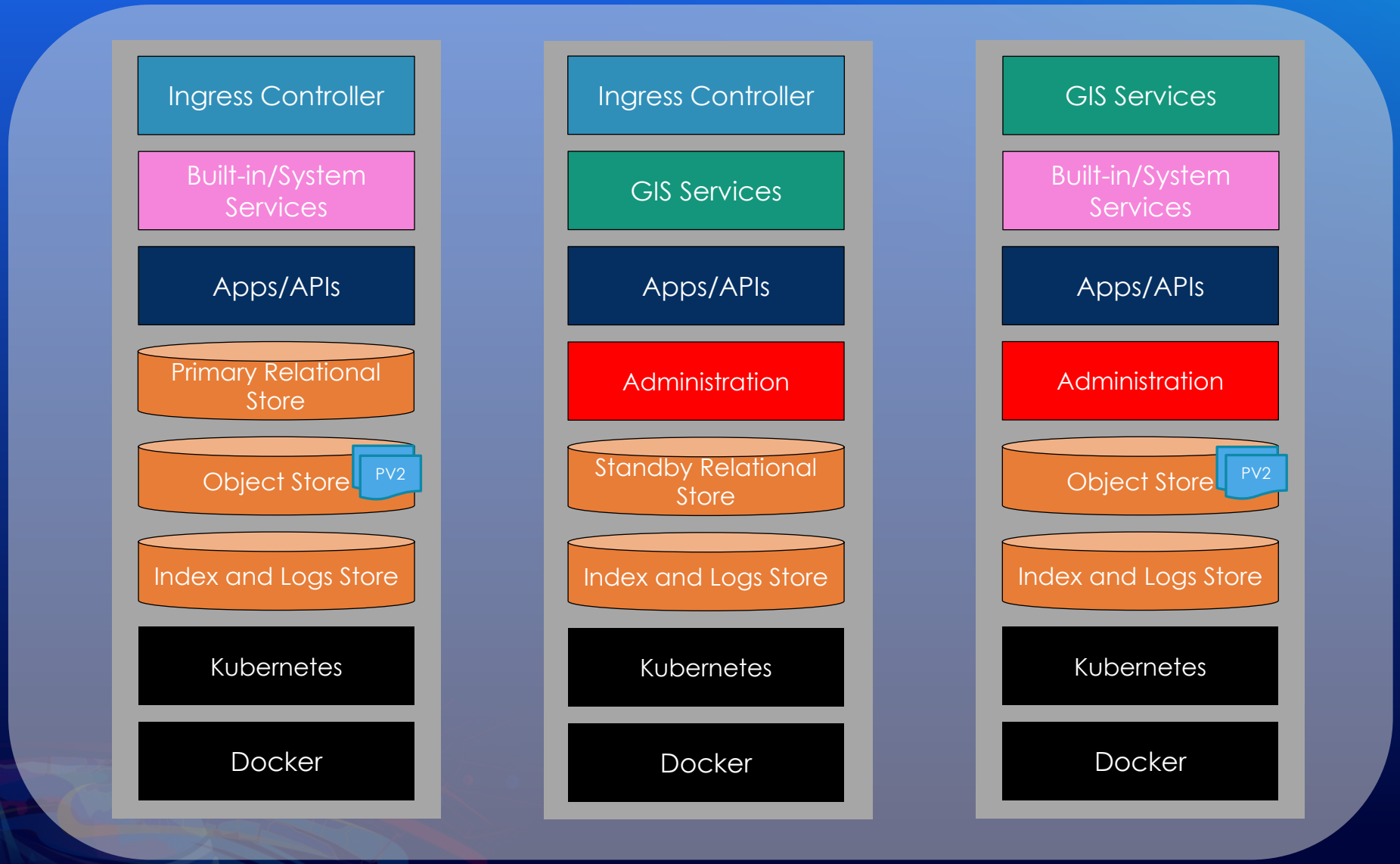
- HA is a spectrum, not a switch
- Inverse relationship between amount of downtime acceptable (RTO) and cost
  - Lower downtime, higher cost
- Designed for production environments and for organizations that have an HA mandate
- No single points of failure
  - Redundancy
  - Scalability



High Availability Profile 1

- Minimum to moderate downtime
- Potential loss of functionality in the event of a failure
- Appropriate for medium sized customers

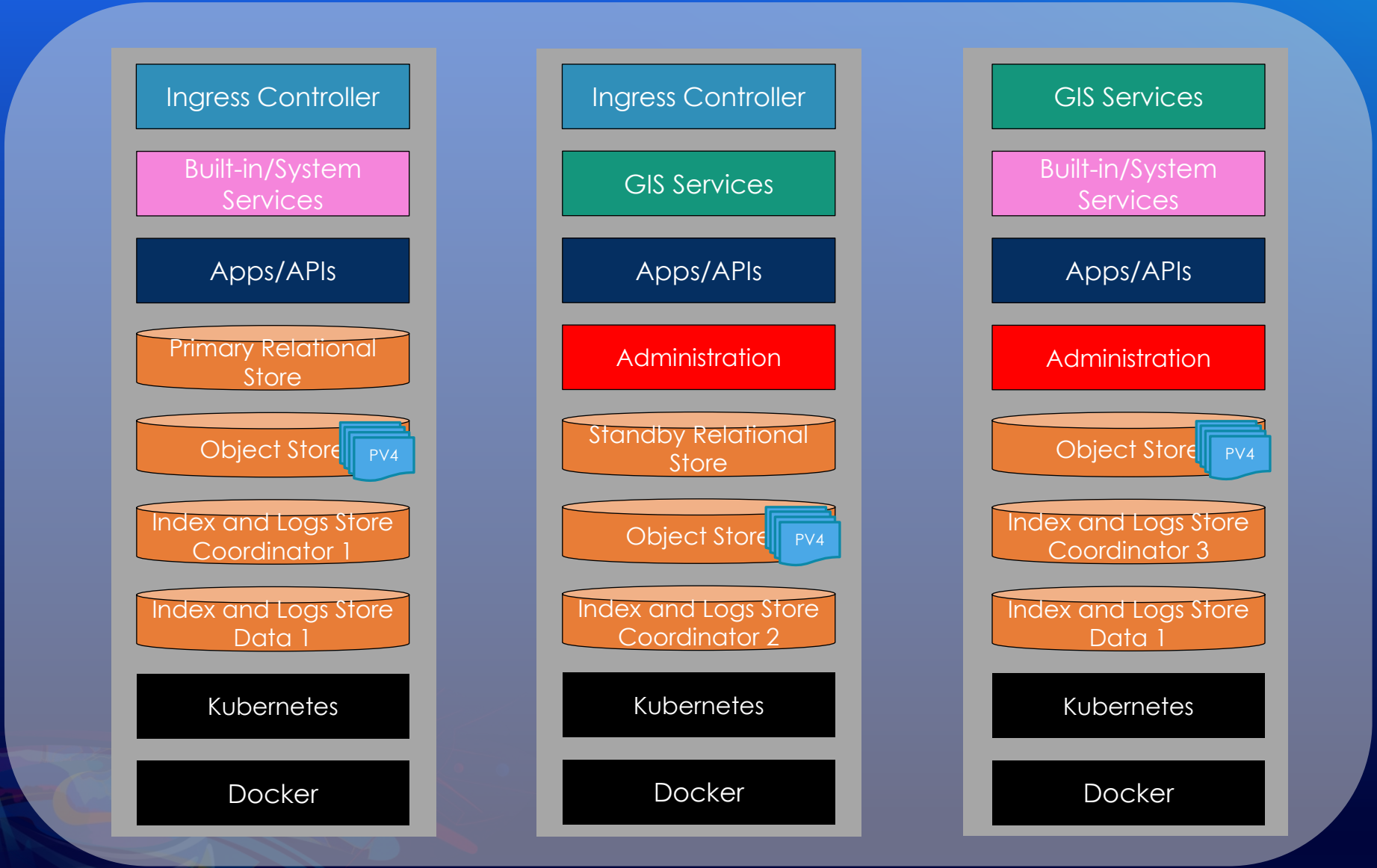
High Availability Profile 1



High Availability Profile 2

- Minimum downtime
- No potential loss of functionality in the event of a failure
- Appropriate for large sized customers

High Availability Profile 2



High Availability - Profile 1 vs Profile 2

Category	Profile 1	Profile 2
Number of logs and index store pods	3	5
Logs and index store pods mode	Mixed mode	Dedicated mode
One object store pod failure	Read-only	Read-Write

High Availability and Disaster Recovery in ArcGIS Enterprise on Kubernetes

Laurence Clinton and Jon Quinn

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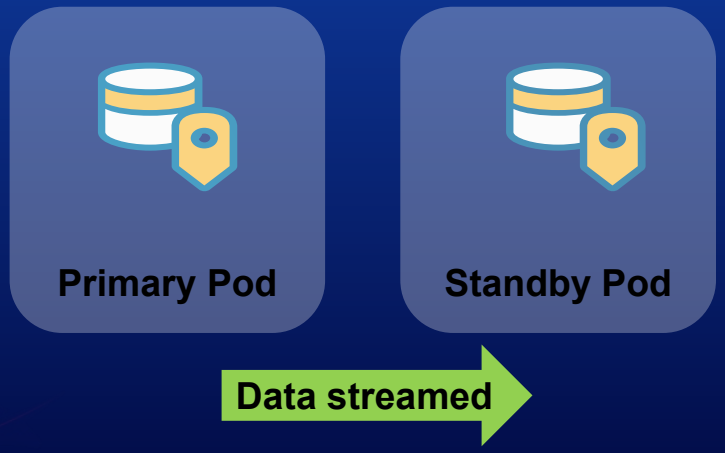
Overview

- Role and purpose of the data stores
  - Relational
  - Object
  - Spatiotemporal and Index
- How high availability works with each store type
- Demo

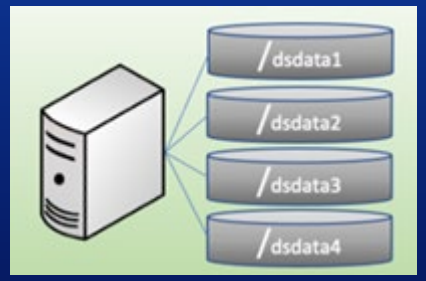
Relational data store high availability

- Primary Standby architecture
- Kubernetes operators determine failover
  - Readiness (ready for traffic?)
  - Liveness (restart pod?)
- Decisions
  - Recreate pod
  - Failover to standby

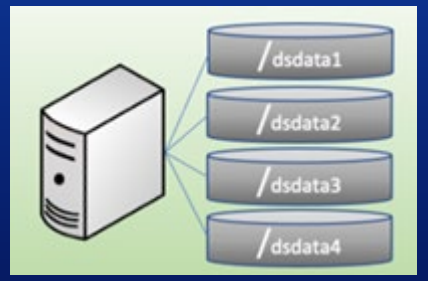


Object store high availability

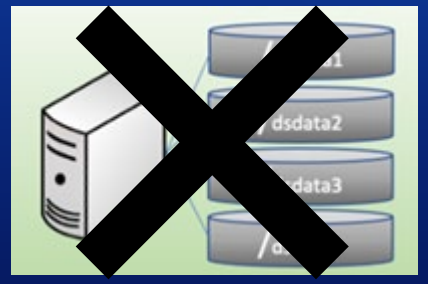
- Liveness and readiness checks
- Configured as standalone or cluster
  - 1 PV as standalone or multiples of 4 PVs for cluster
- If greater than half nodes\disks available
  - > Read write



Object store pod



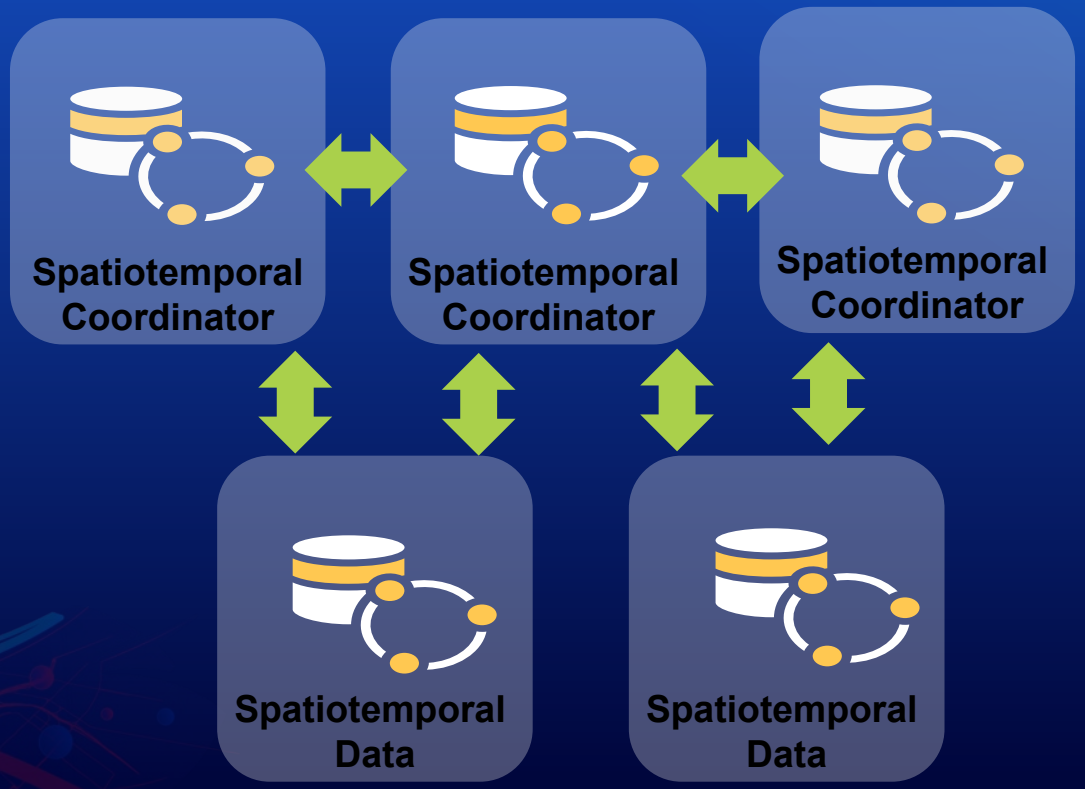
Object store pod



Not available

Spatiotemporal and index store high availability

- Liveness and readiness checks
- Sharding replication for HA



APIs
ArcGIS Enterprise on Kubernetes

Moginraj Mohandas

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ArcGIS Enterprise on Kubernetes – powered by rich set of APIs

NEW

Administrative API

- Single Administrative API for ArcGIS Enterprise on Kubernetes
- Replaces Portal/Server Admin APIs
- Not backward compatible(with a few exceptions)
- Simple HTML interface
- Heirarchical architecture of resources/operations

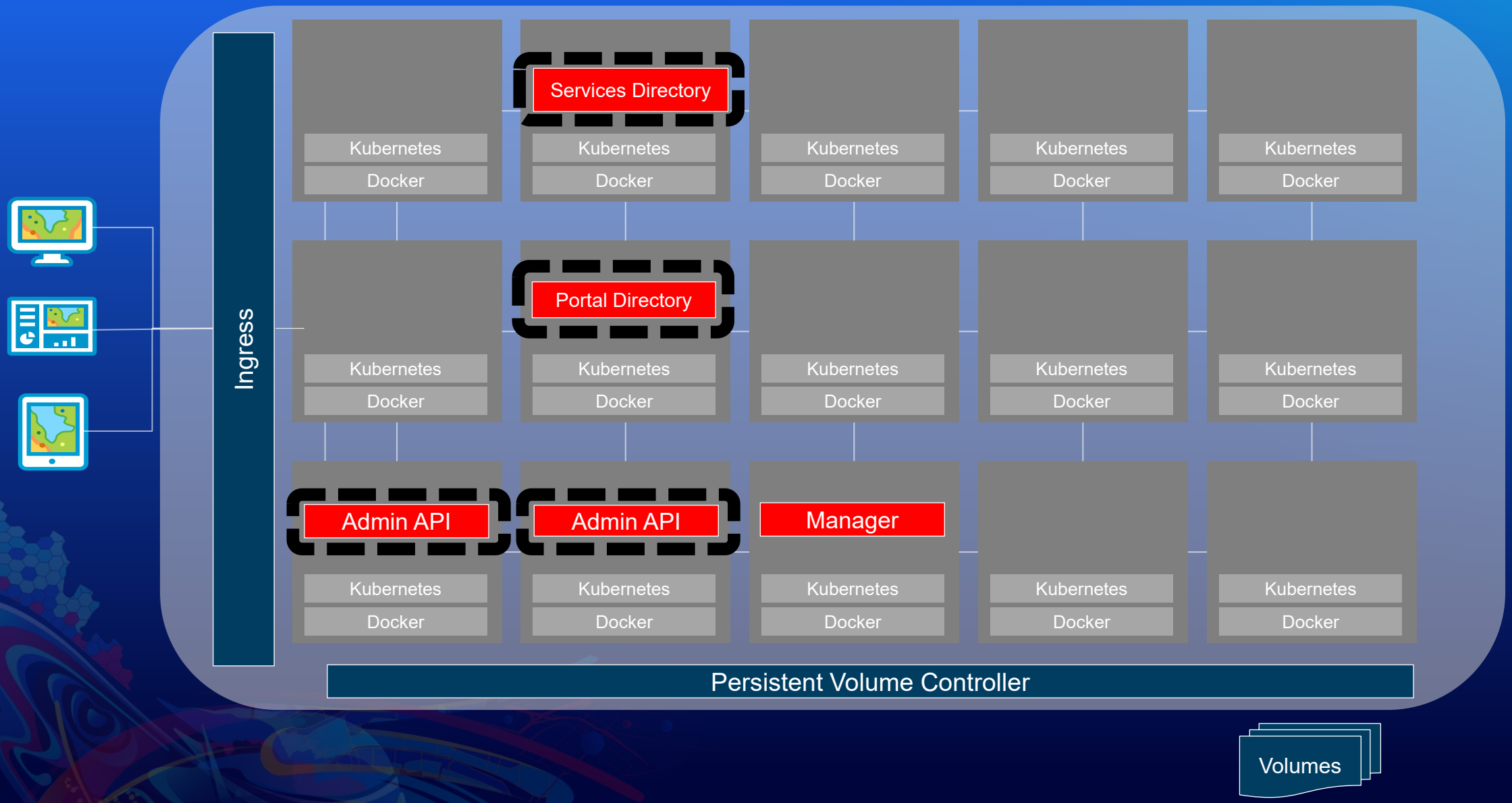
Sharing API

- API for managing users, groups and items
- HTML view
- No change from Windows/Linux
- Backward compatible

Services API

- API for services
- HTML view
- No change from Windows/Linux
- Backward compatible

APIs


Ingress
Services Directory
Portal Directory
Admin API
Admin API
Manager
Kubernetes
Docker
Persistent Volume Controller
Volumes

In this session we covered…

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