Web GIS Architecture Deployment Options

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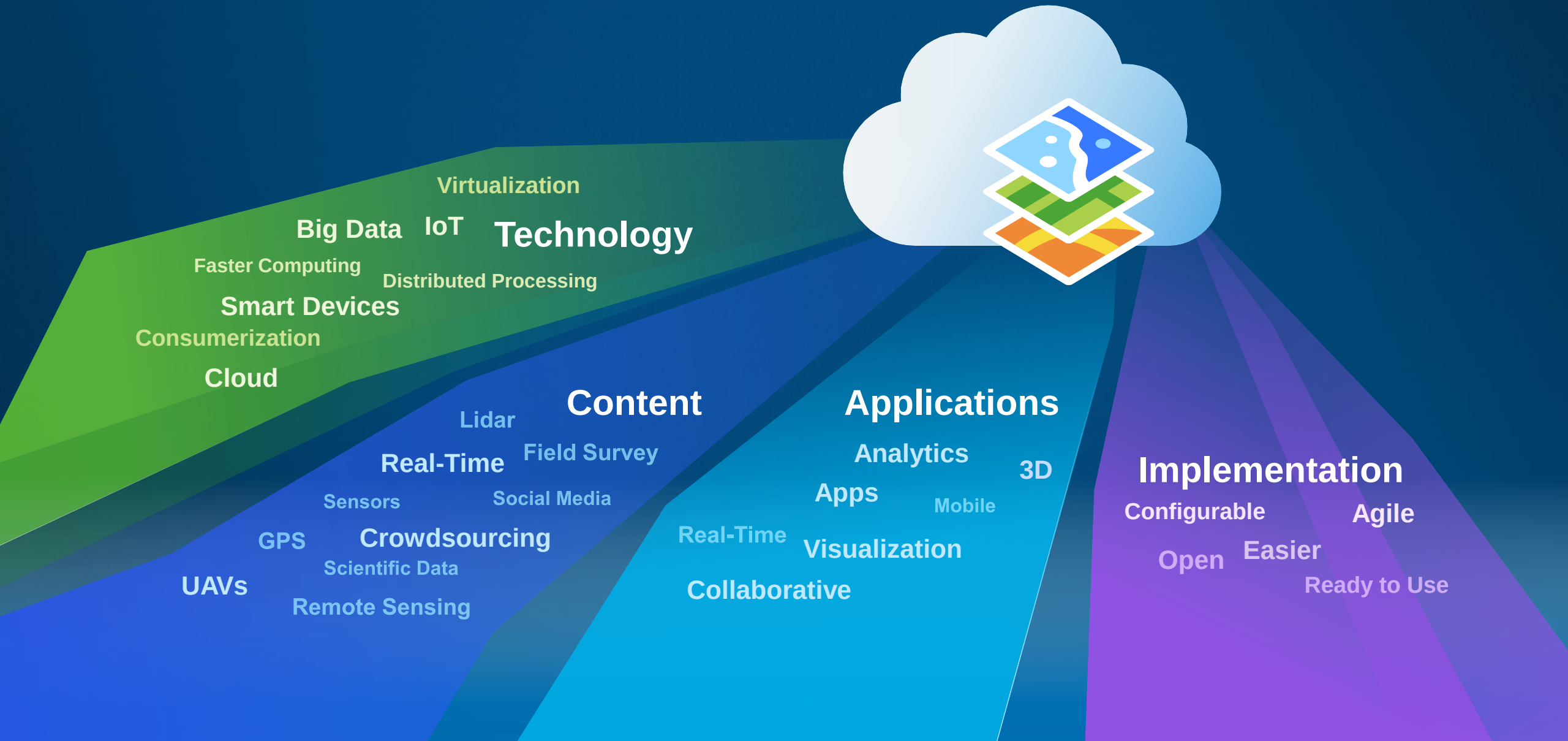
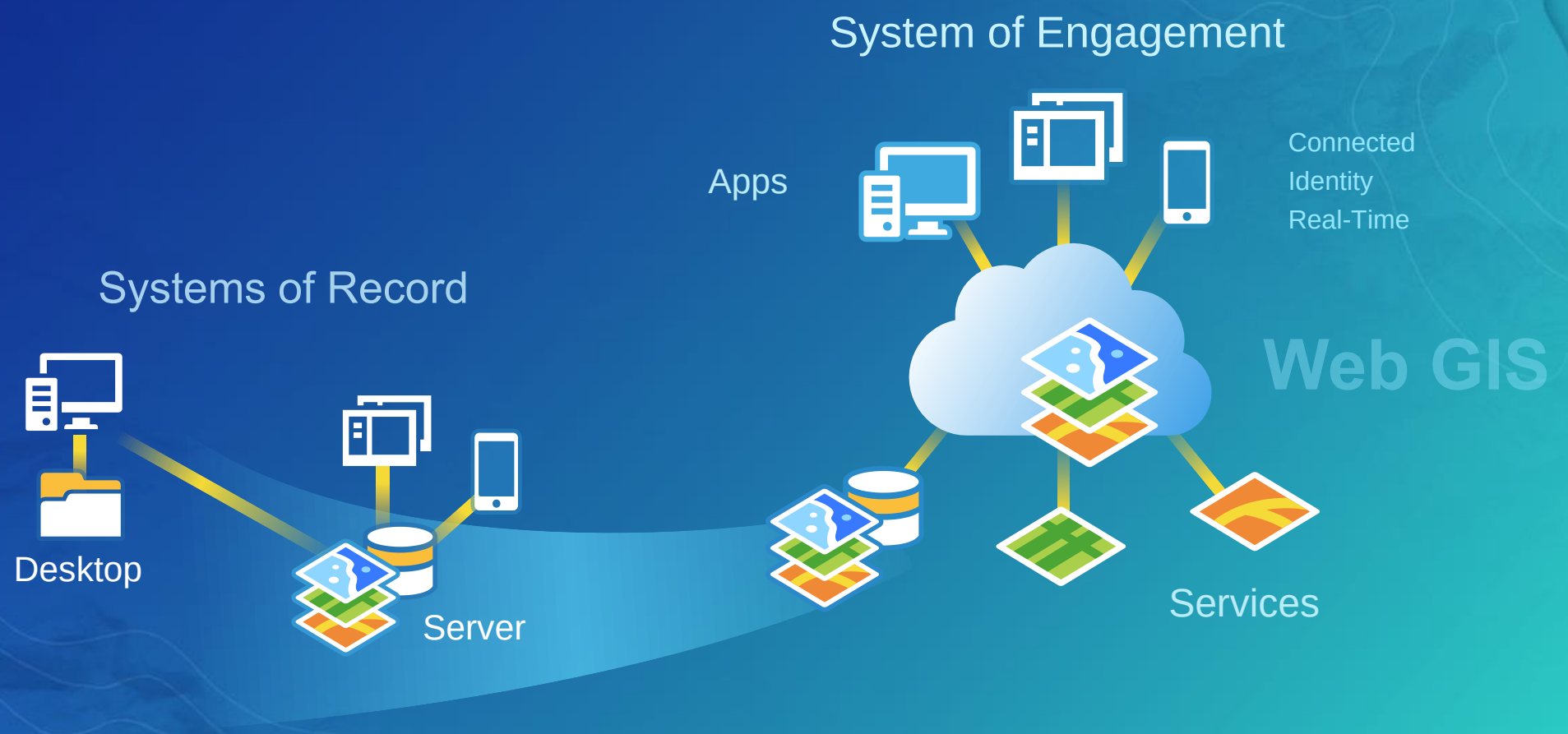
Our World Is Evolving



GIS is Evolving

Opening, Integrating and Simplifying Everything



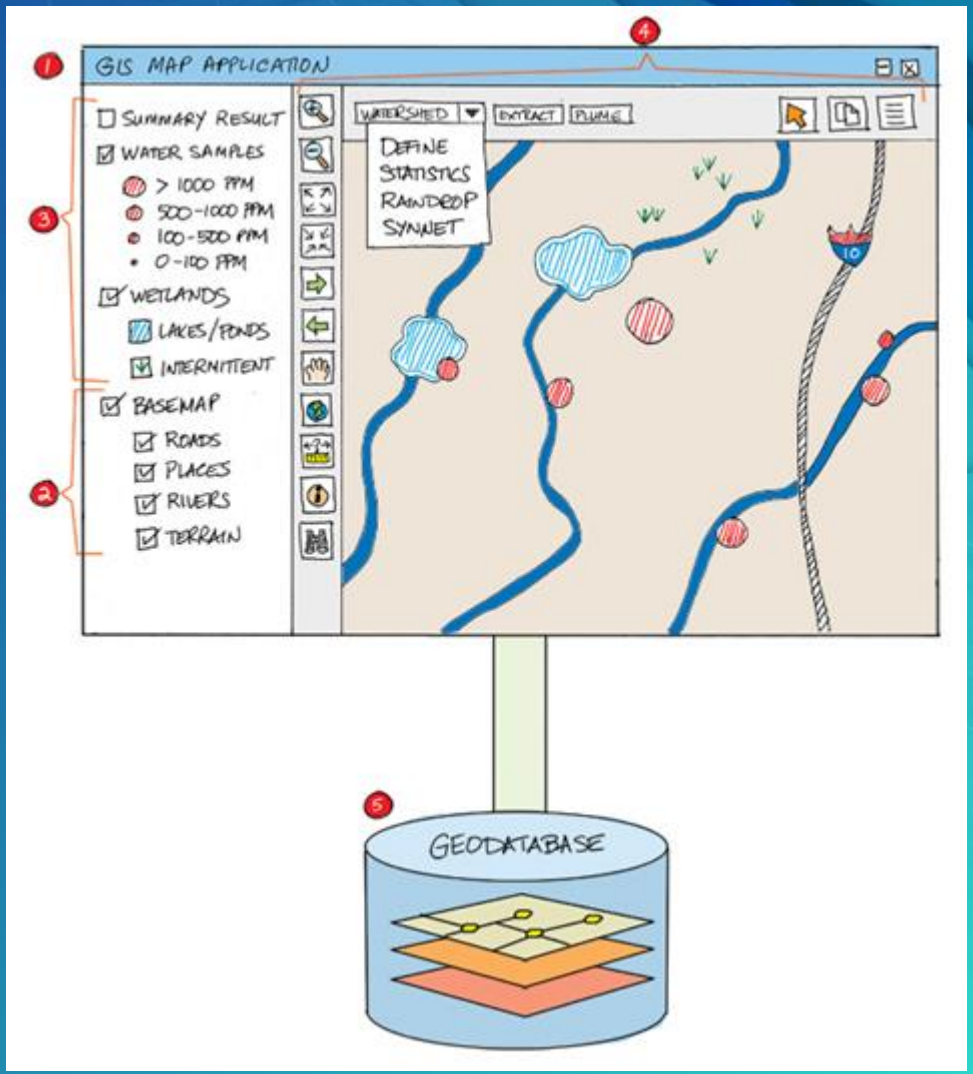
Integrating Existing Systems . . .

. . . Creating a System of Systems

What is Web GIS and ArcGIS Enterprise?

What is GIS?

- **A web application**
- **Digital basemaps**
- **Operational layers**
- **Tasks and tools in the web GIS application**
- **One or more geodatabases**



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What's included with ArcGIS Enterprise?

- ArcGIS Server—the core web services component for making maps and performing analysis.
- Portal for ArcGIS—allows you to share maps, applications, and other geographic information with other people in your organization.
- ArcGIS Data Store—lets you configure data storage for hosting and federated servers used with your deployment.
- ArcGIS Web Adaptor—allows you to integrate your ArcGIS Server and Portal for ArcGIS with your existing web server and your organization's security mechanisms.

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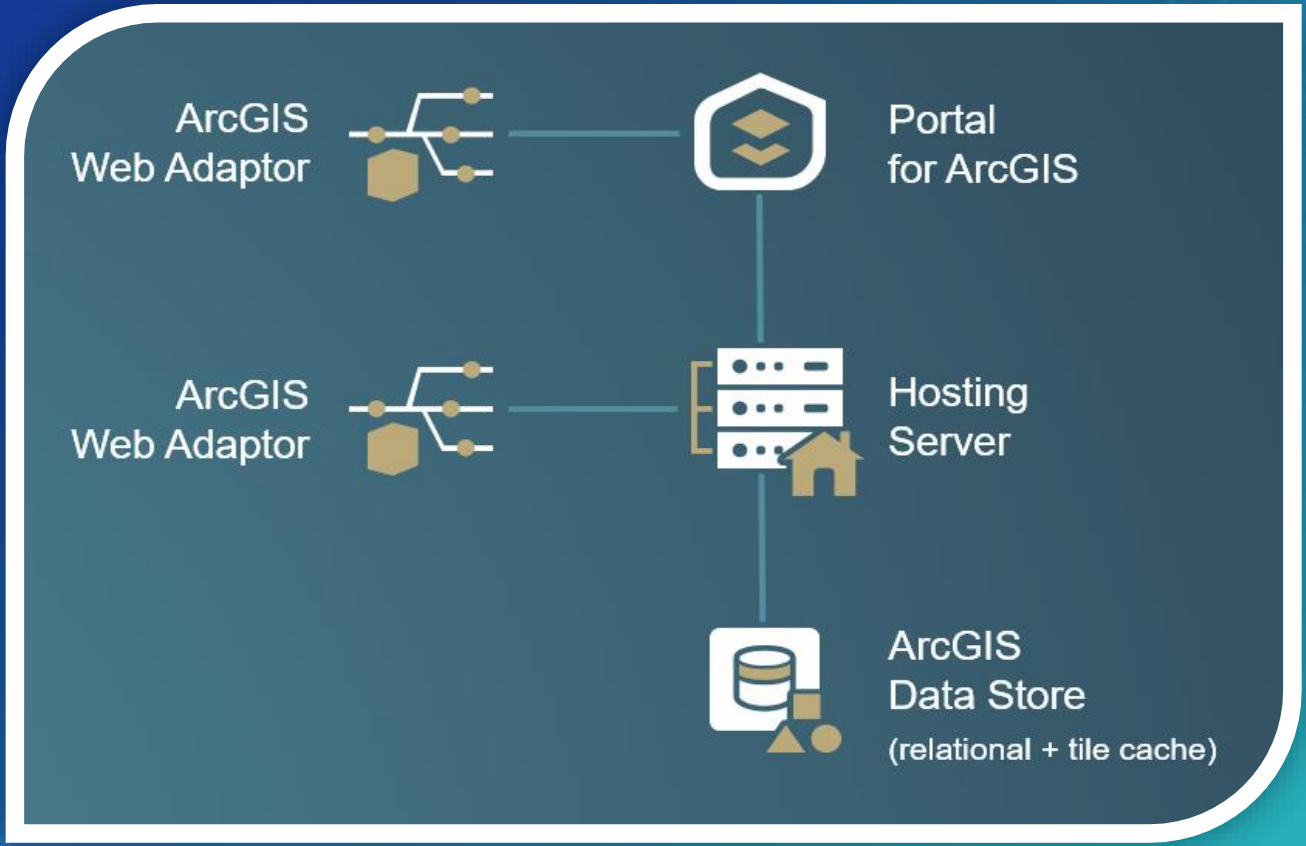
Base ArcGIS Enterprise Deployment



Federate ArcGIS Server

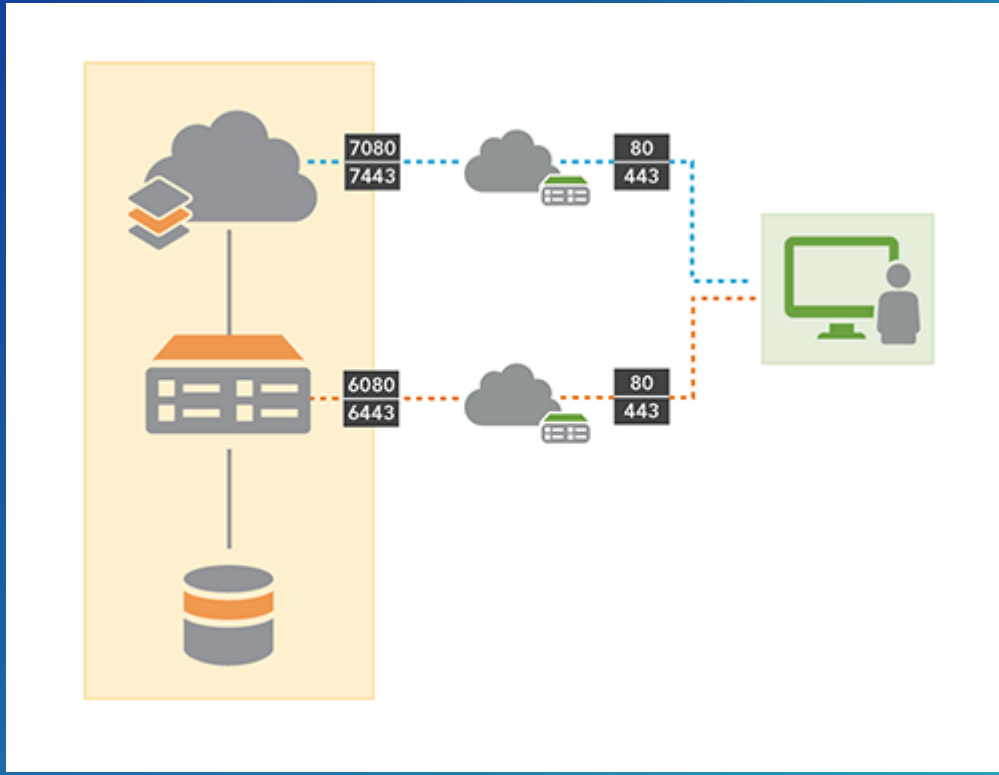
- Features requiring federation:
  - Automatic item creation in Portal
  - Enterprise Logins (SAML 3.0)
  - Publishing 3D scene layers
  - Publishing from ArcGIS Pro
  - Standard Analysis Tools in Portal
  - Publishing Vector Tiles
  - High Volume Archiving from GeoEvent (Spatiotemporal Data store)
  - Raster Analytics
  - GeoAnalytics
  - Insights for ArcGIS
  - Survey123

Multiple cluster functionality in ArcGIS Server is being deprecated.

Distributed collaboration (Sharing Items from ArcGIS Enterprise to ArcGIS online)

ArcGIS Enterprise Machine and Tier Deployment Options

Singe machine



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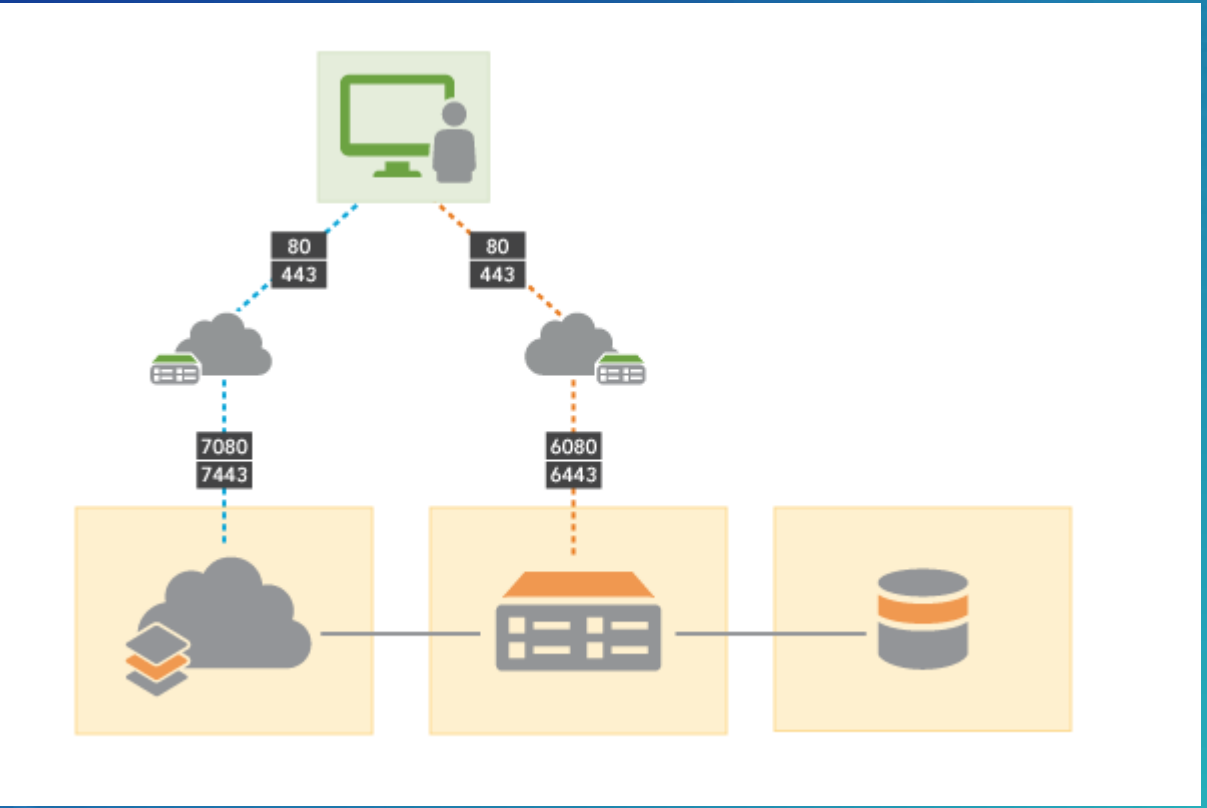
Multitiered Deployment



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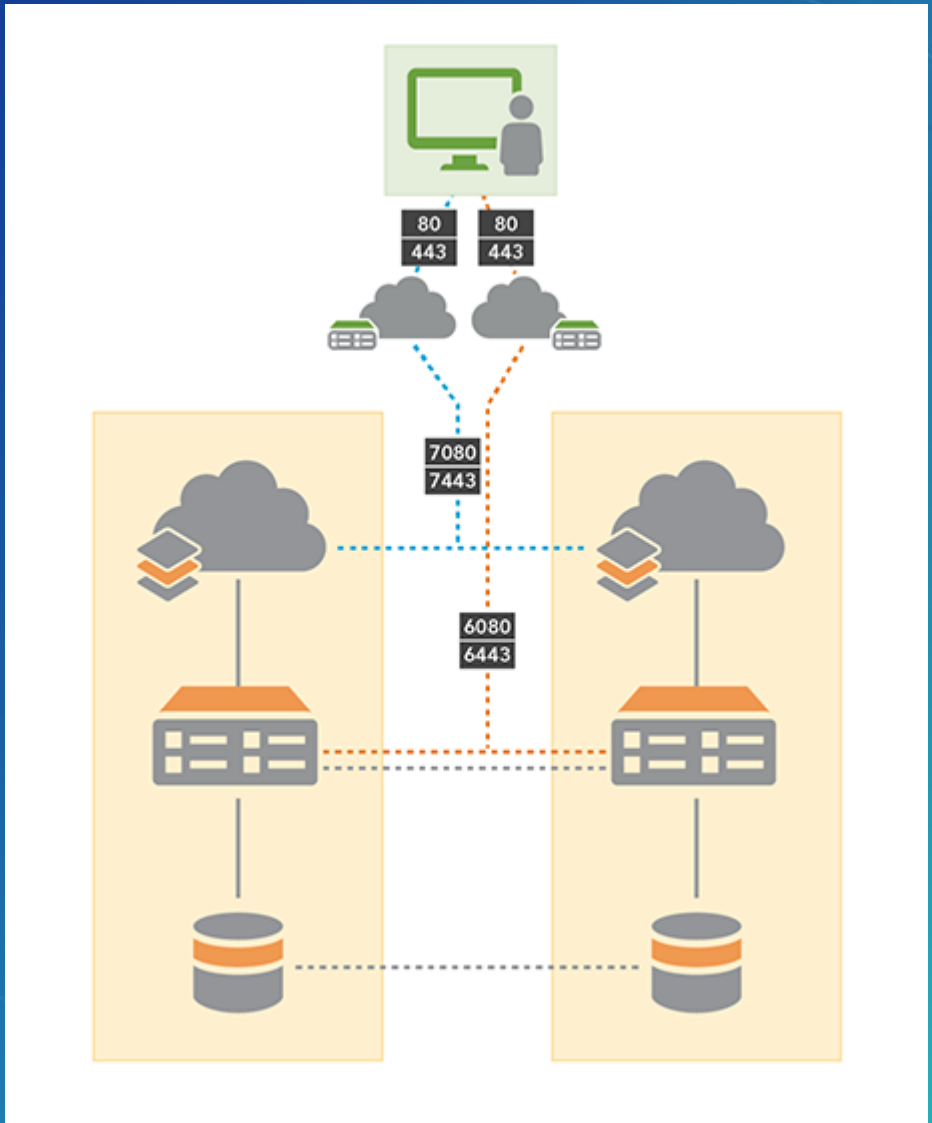
Highly Available Deployment



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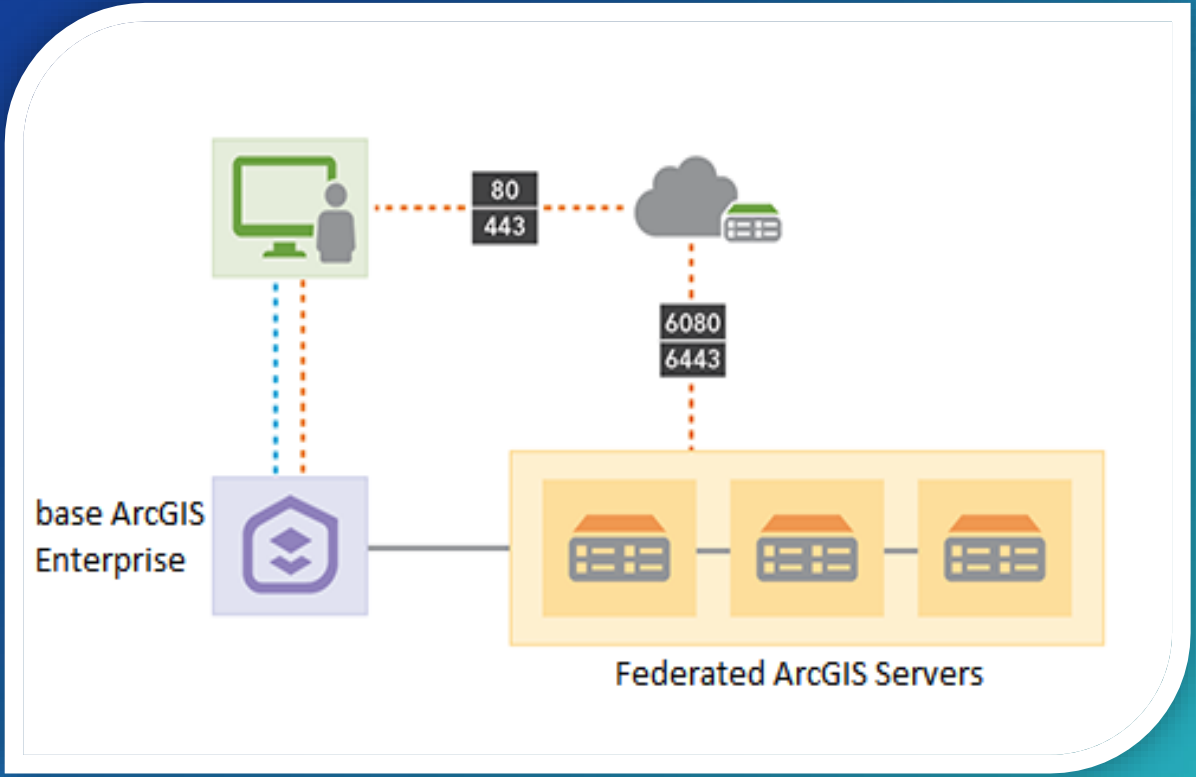
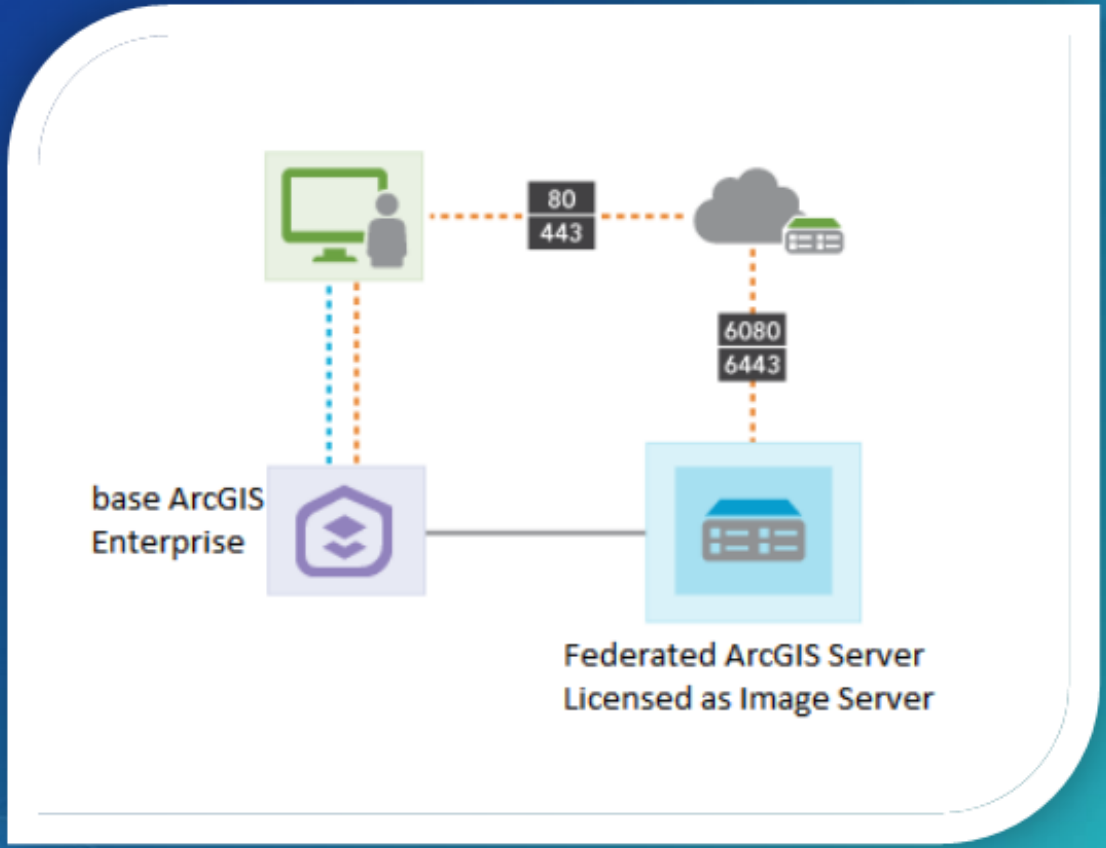
ArcGIS Enterprise
Capabilities
Deployment Options

ArcGIS Server



ArcGIS Image Server



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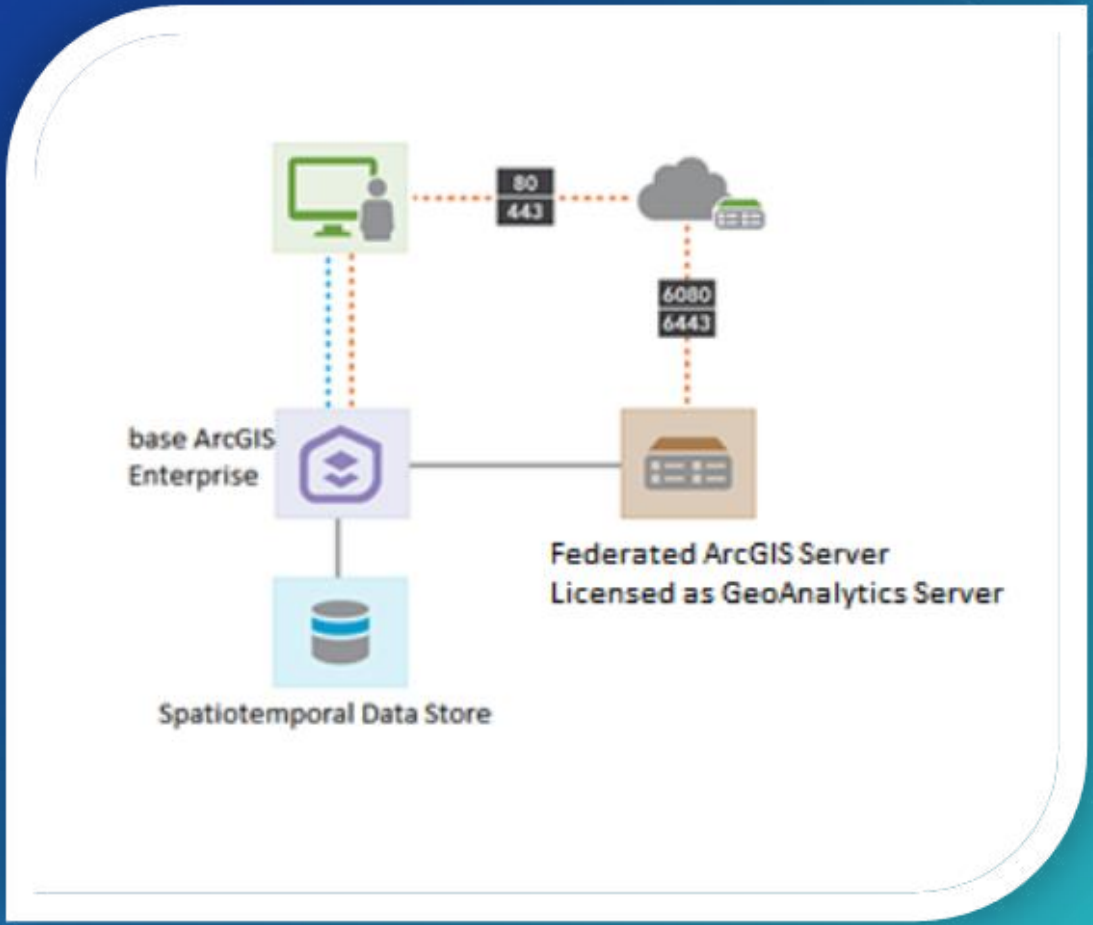
ArcGIS GeoAnalytics Server



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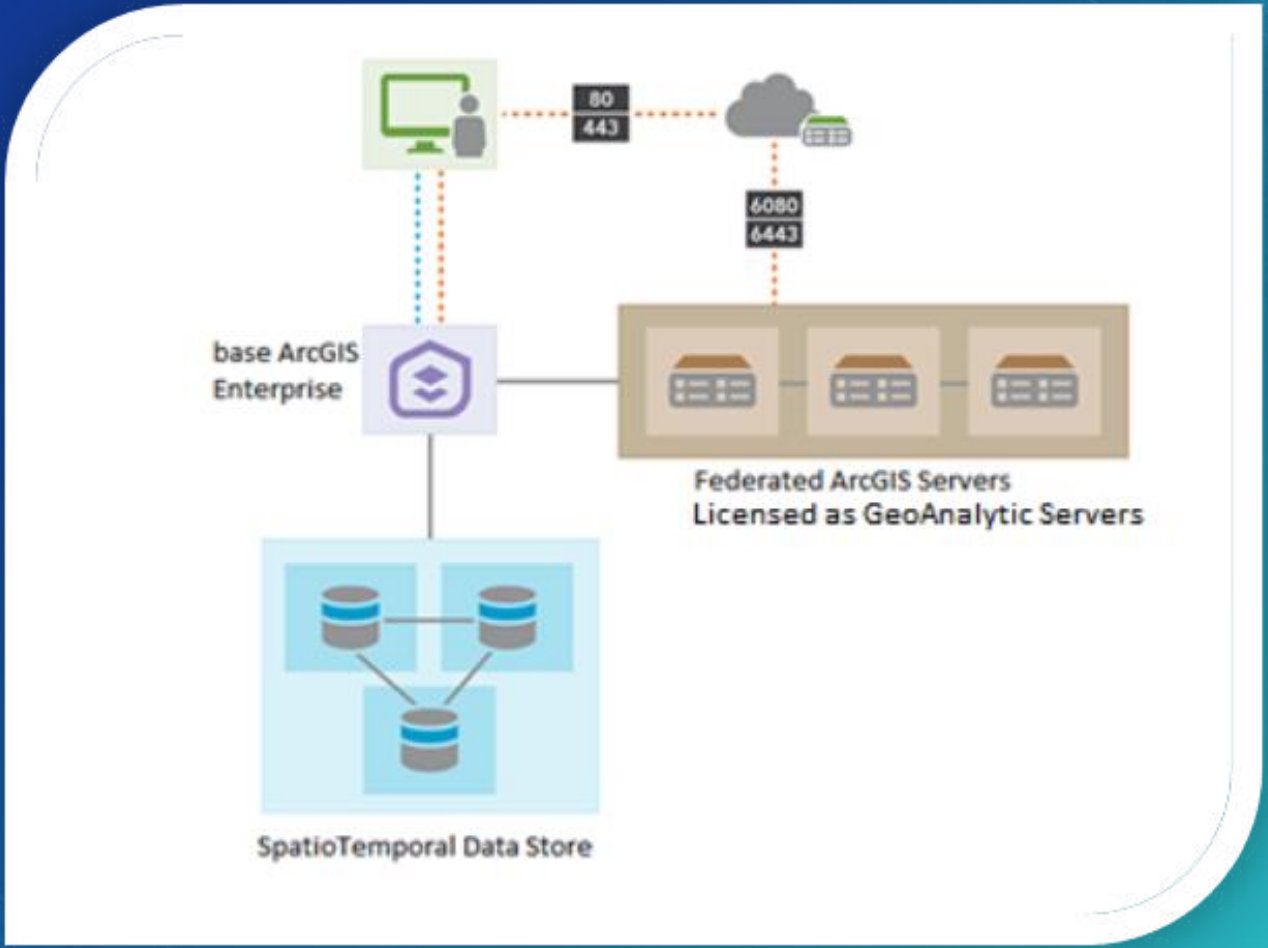
ArcGIS Multi-GeoAnalytics Server



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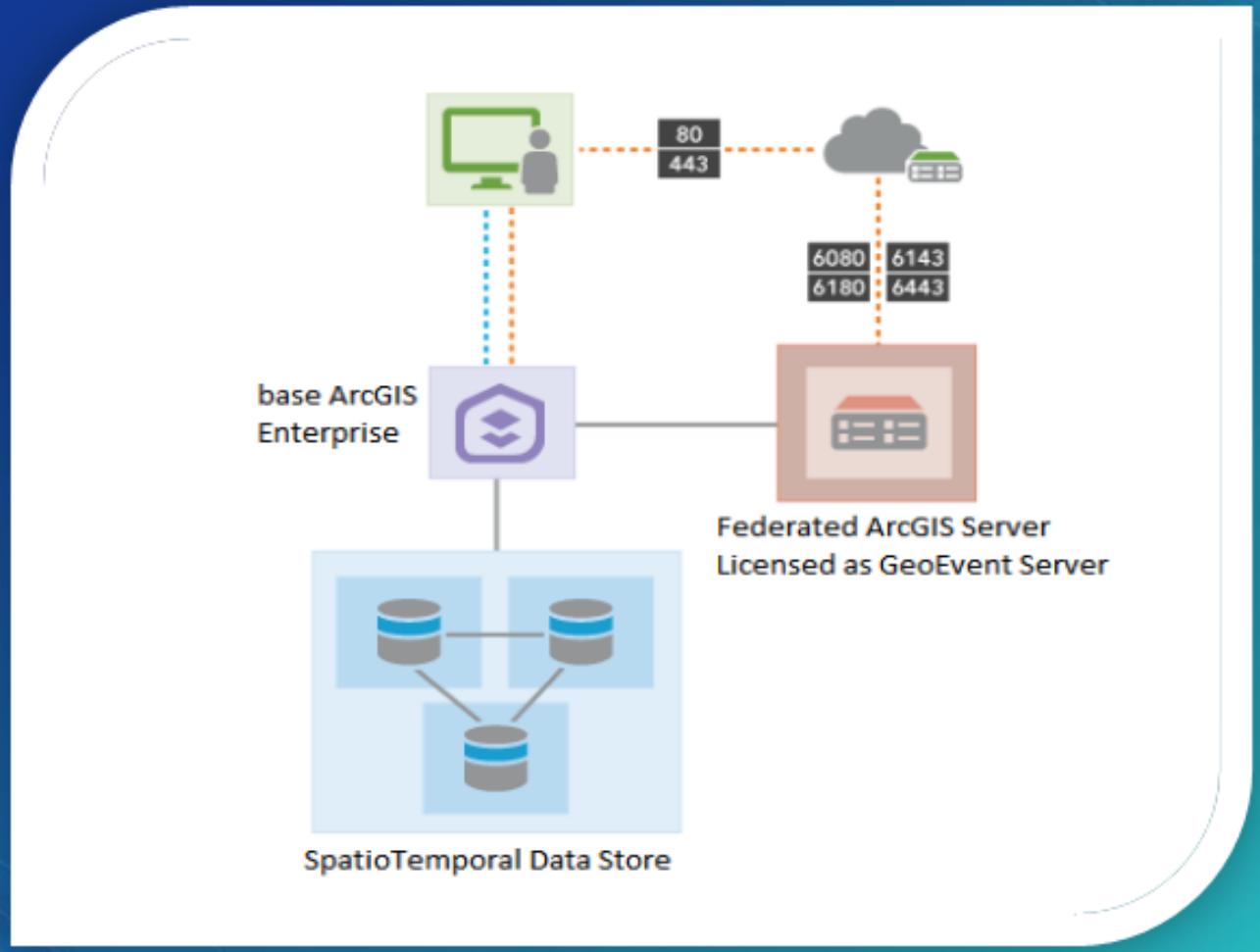
ArcGIS GeoEvent Server



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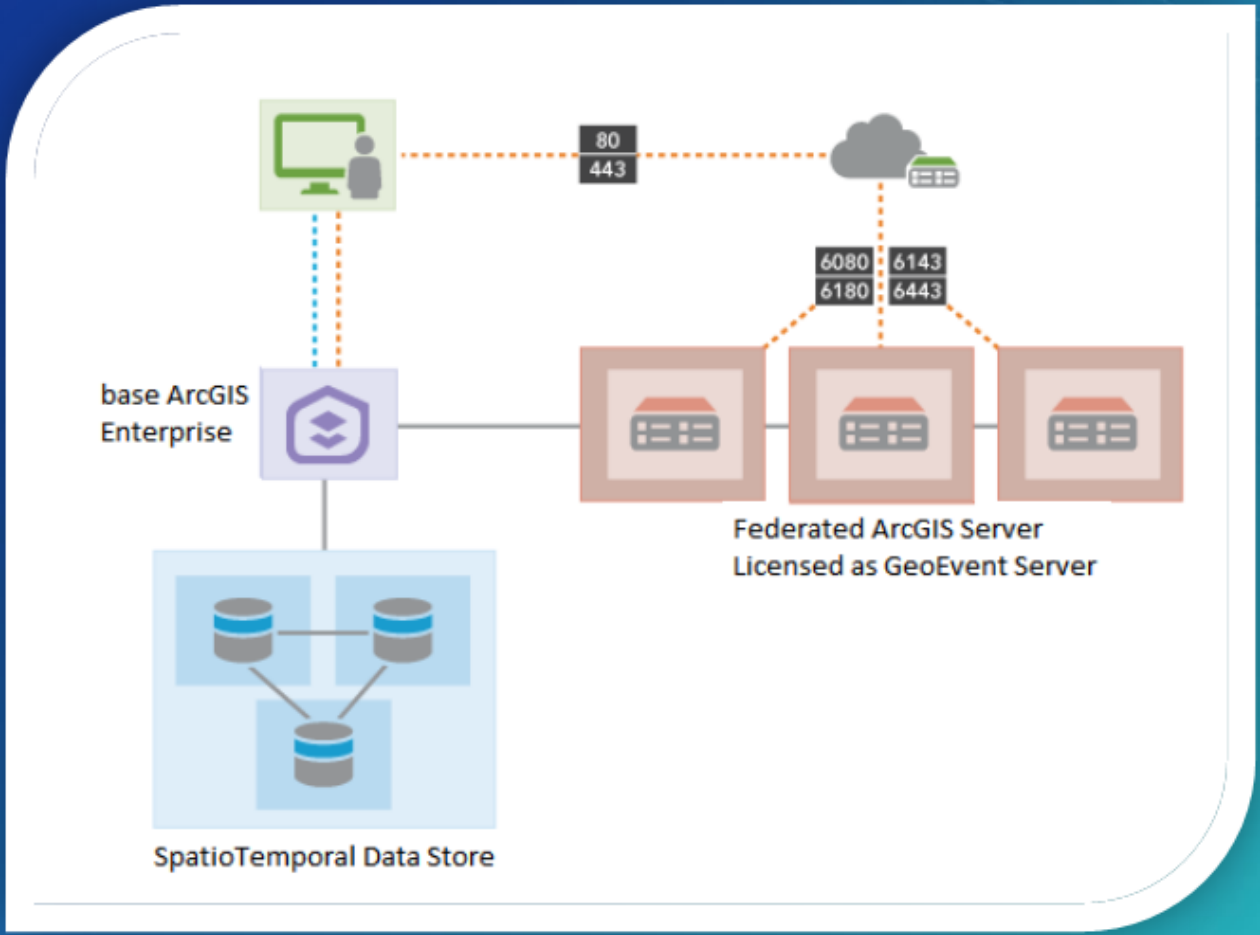
ArcGIS Multi-GeoEvent Server



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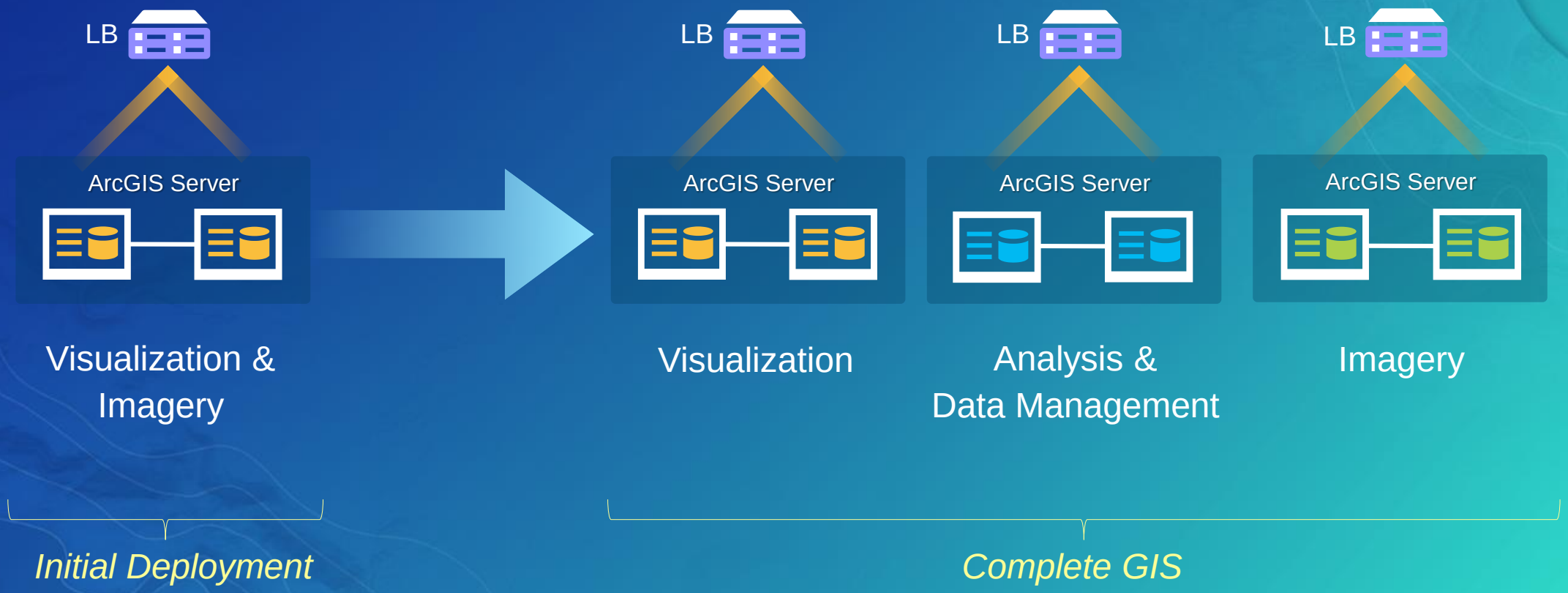
Scaling and Workload Separation

Workload Separation



Server Roles

- **Follow best practices on workload separation and assign only *one* server role per ArcGIS Server site**

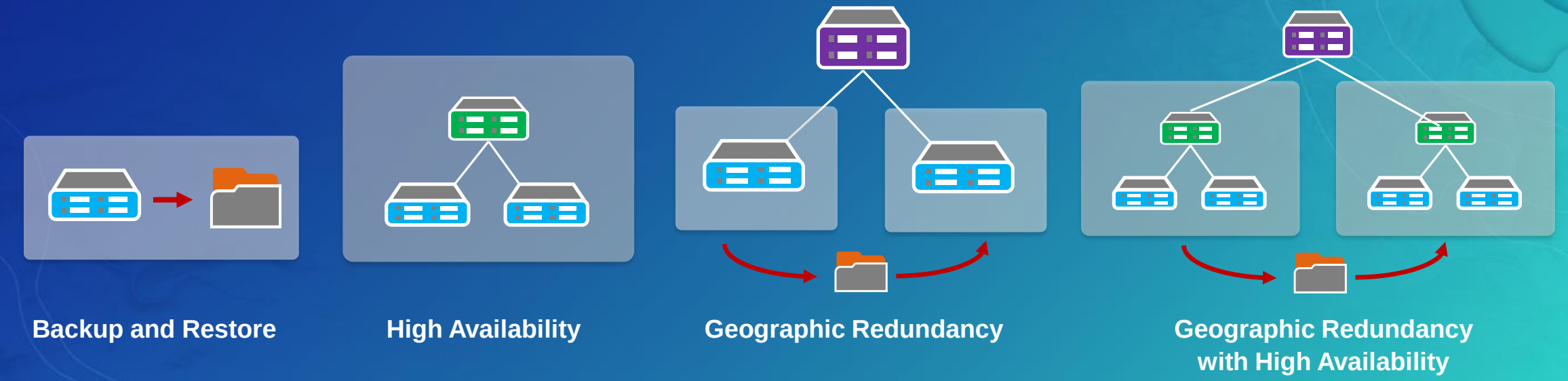
- **If small site and consider combining multiple server roles in a single site:**
  - ***Be careful*** **combining GIS Server role with other server roles**
  - ***Be careful*** **combining Image Server role with other server roles**
  - ***Avoid*** **combining GeoEvent Server role with other server roles**
  - ***Never*** **combine GeoAnalytics Server role with any other server role**

Scaling the base ArcGIS Enterprise deployment

- Conduct capacity planning and testing
- Add machine to hosting server as needed, especially when using:
- Spatial analysis tools
  - http://server.arcgis.com/en/portal/latest/administer/windows/configure-the-portal-to-perform-analysis.htm
- Insights for ArcGIS
  - http://server.arcgis.com/en/insights/latest/administer/windows/configure-the-portal-to-support-insights-for-arcgis.htm

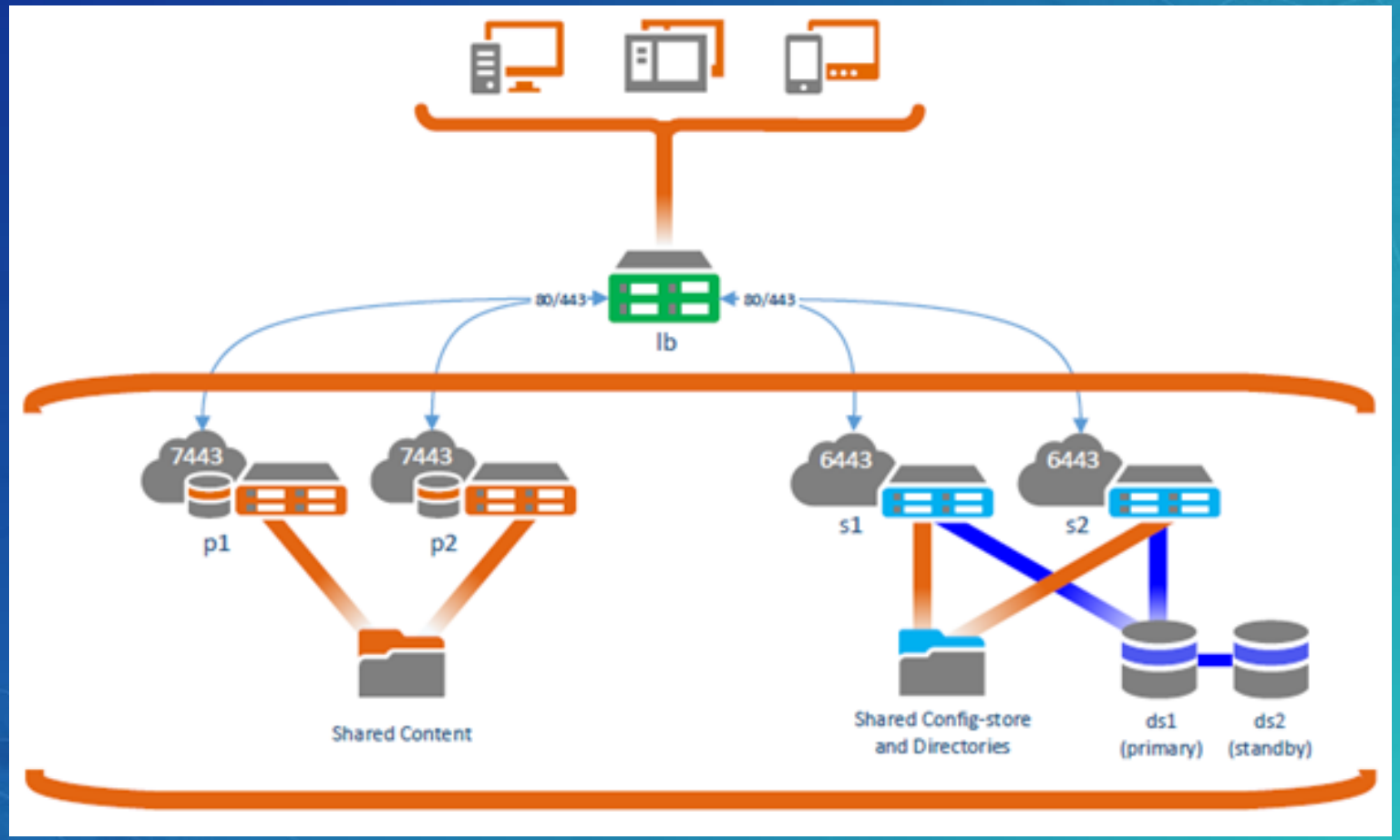
High Availability Options

Strategies for minimizing downtime and data loss

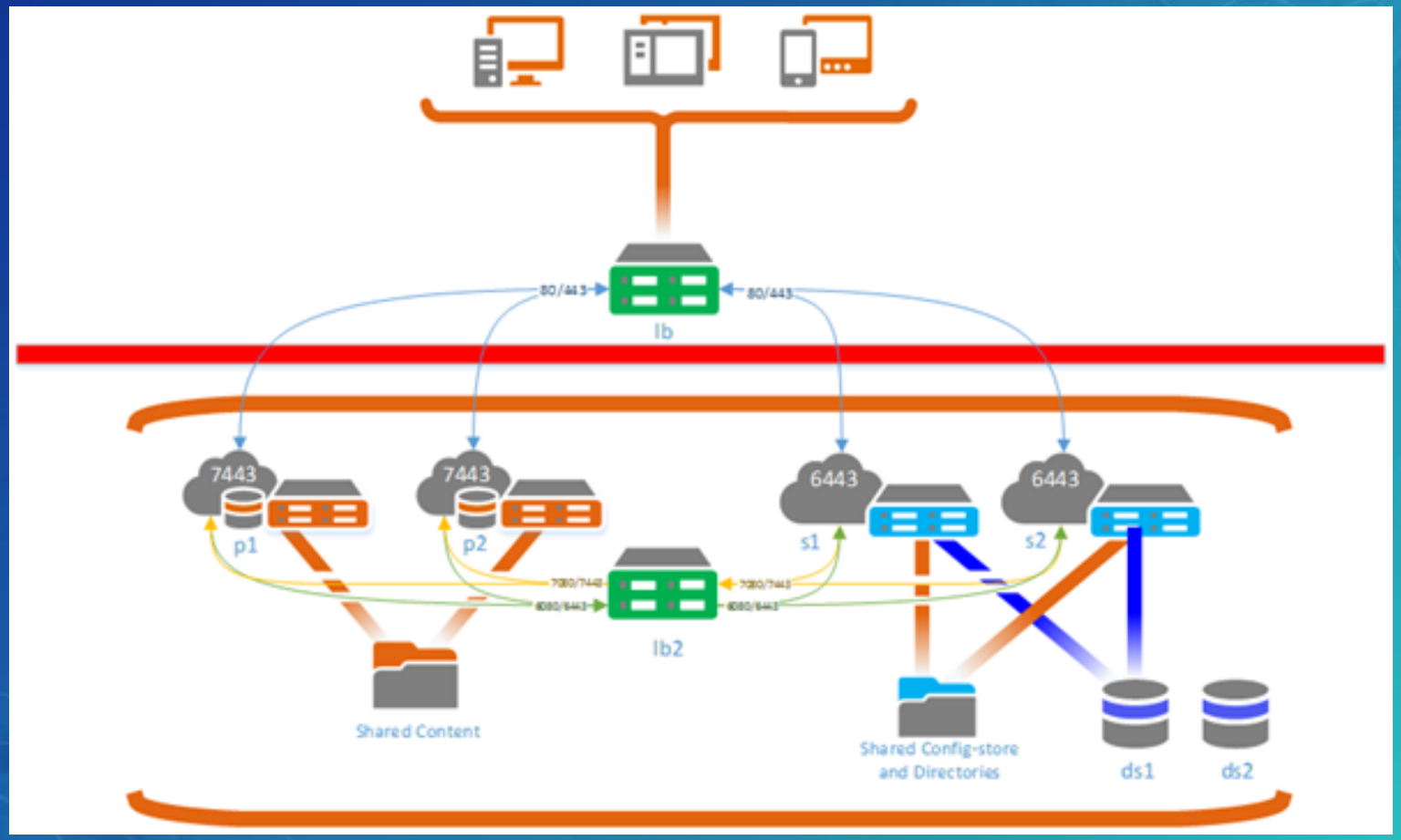


Increasing complexity and required resources

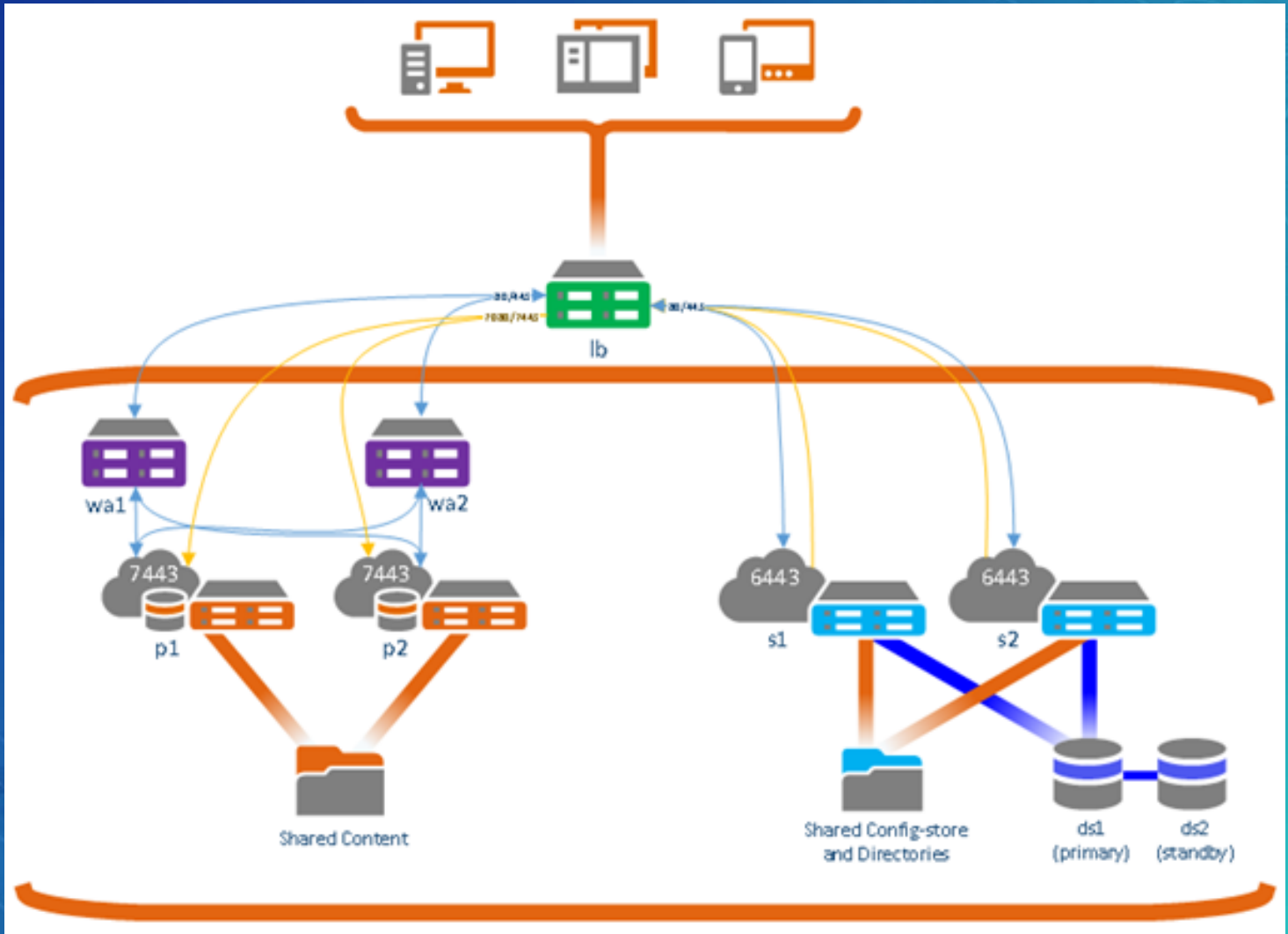
Built-in users, inside firewall



Built-in users with public access to the portal



IWA or LDAP authentication with client access internal



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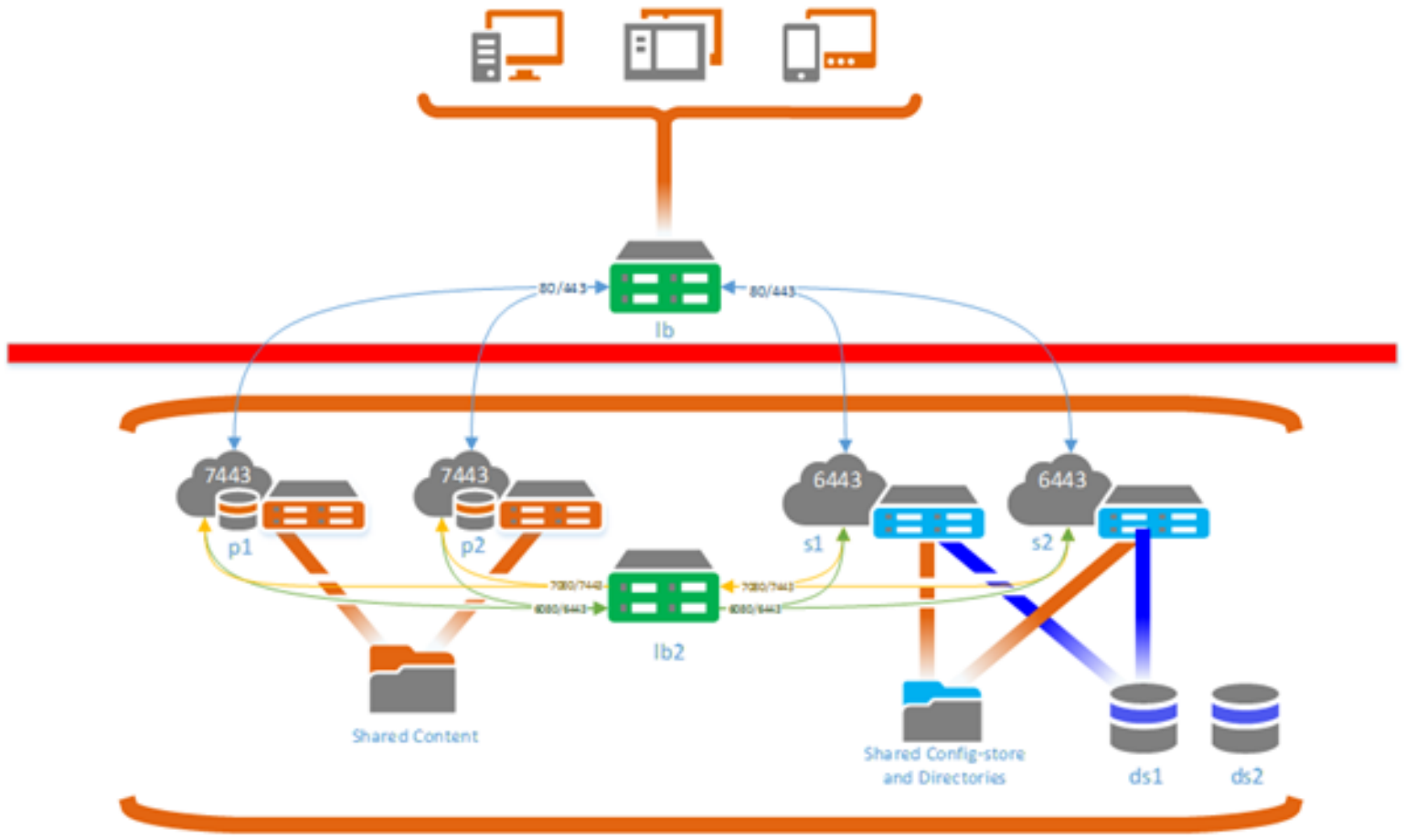
SAML or ADFS authentication with public access to the portal

Secure a publicly accessed portal using load balancers



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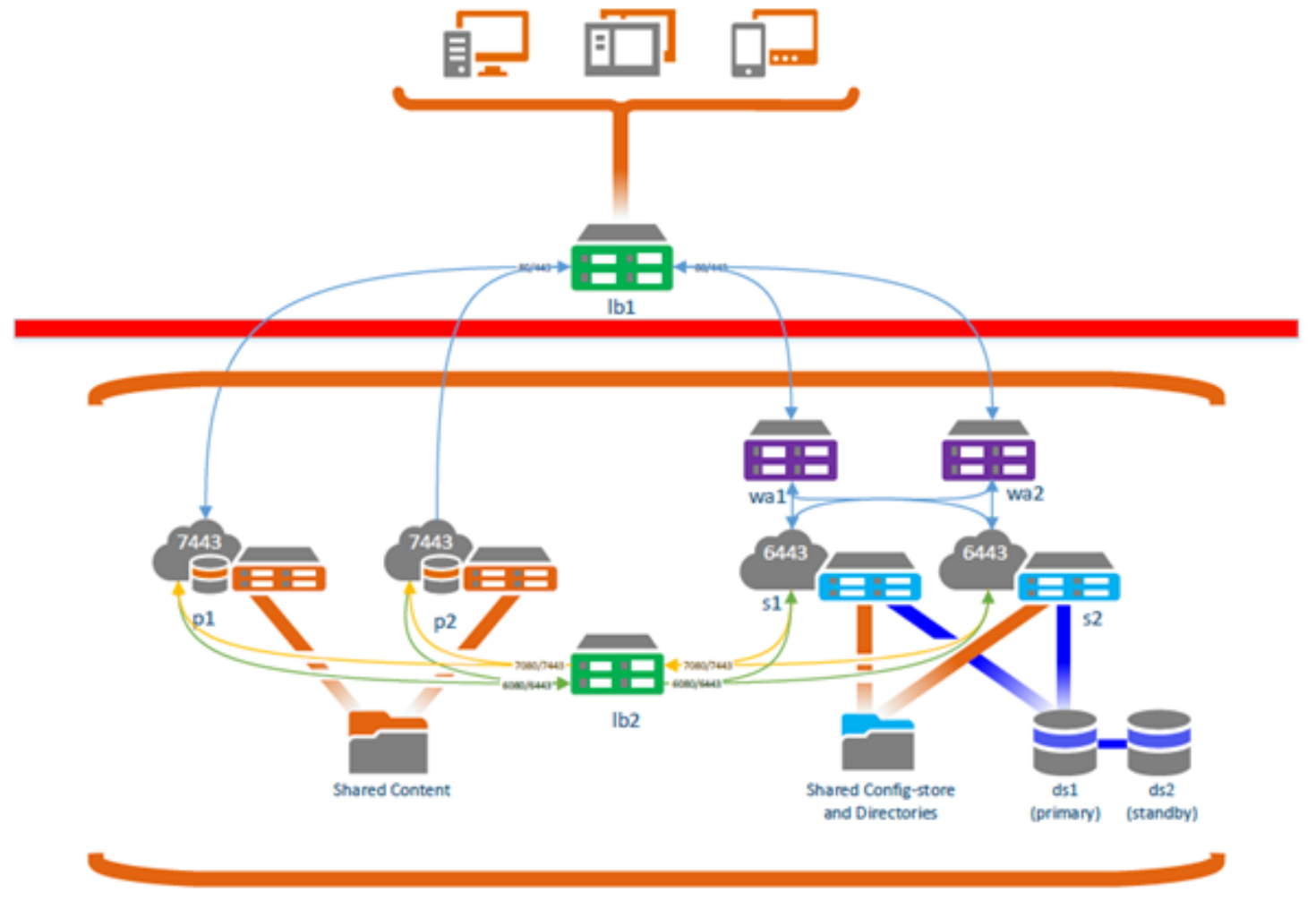
SAML or ADFS authentication with public access to the portal

Secure a publicly accessed portal using web adaptors



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Cloud Architecture Options

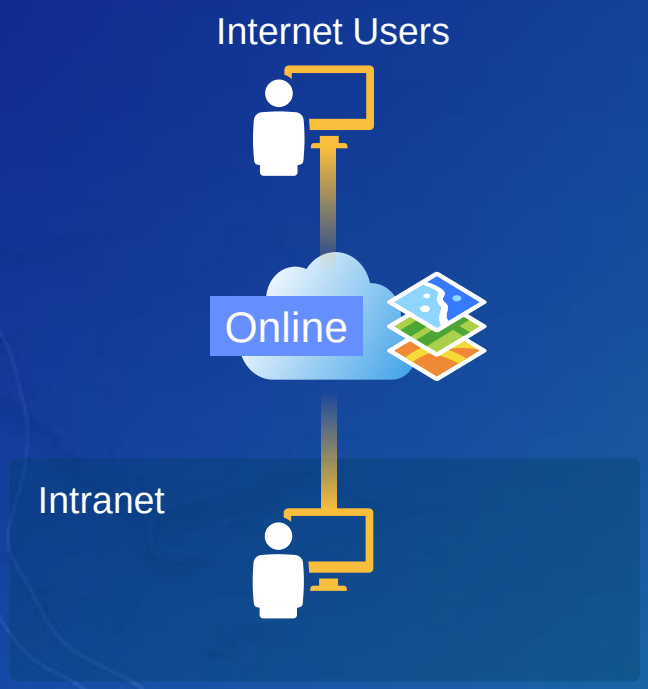
On-Premises, Online or hybrid

On-premises

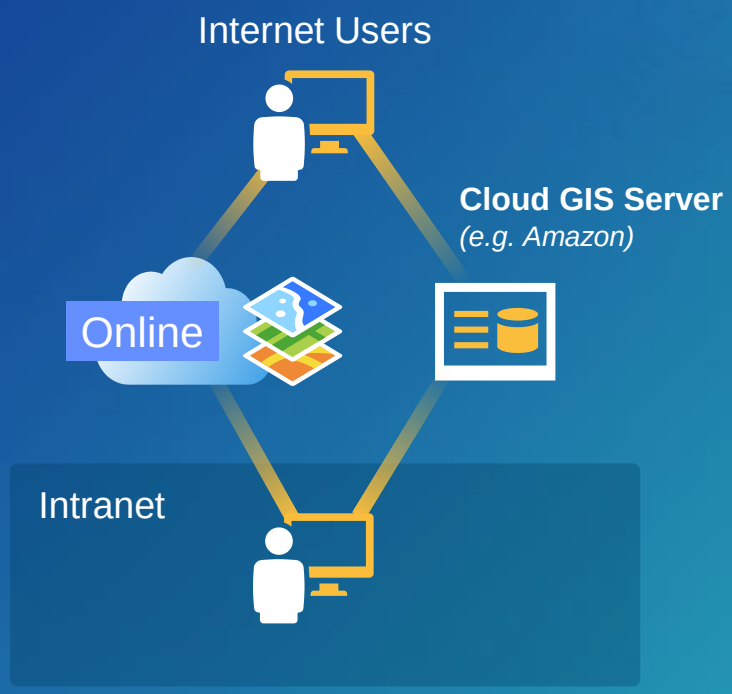
Public Cloud

Hybrid

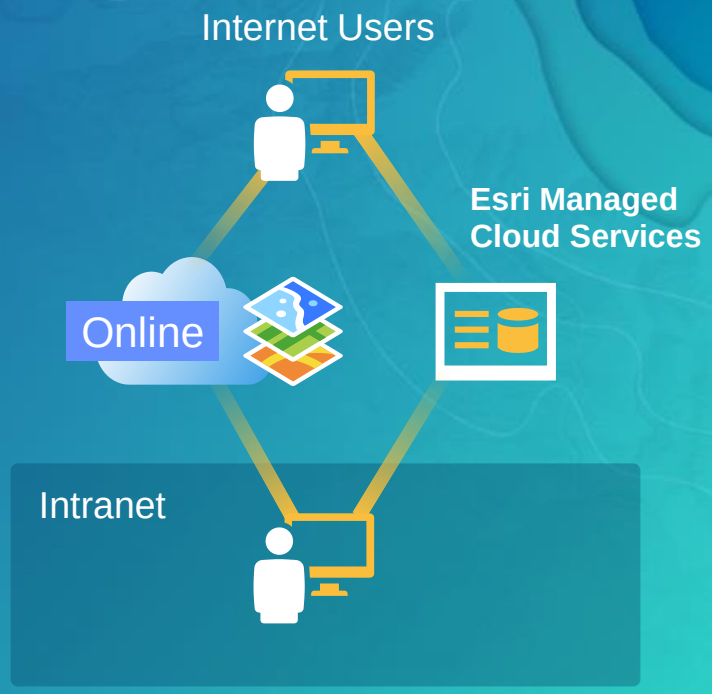
Cloud Options



ArcGIS Online



ArcGIS Online
w/ Cloud GIS Server(s)



ArcGIS Online
w/ Esri Managed Cloud Svcs

On-Premises, Online or hybrid

- Online
  - Fast Start & No Additional Software
  - Likely Lower TCO
  - Some “Metadata” Stored in Cloud
  - Limited Functionality

- On-premises or hybrid
  - More Control
  - All Data & Metadata On-Premises
  - More Security Integration Options
  - Additional Software to Manage
  - Architecture Becomes More Complex

ArcGIS Online and Managed Services

Users

- ✓ Desktop
- ✓ Web
- ✓ Mobile

ArcGIS Online

- ✓ Online Basemaps
- ✓ Geocoding, Routing
- ✓ Hosted Feature & Tile Map Services
- ✓ App Templates

Esri Managed Services

- ✓ Custom Web Apps
- ✓ GP, Reporting Services
- ✓ Imagery, Large Datasets
- ✓ Dynamic Map Services
- ✓ RDBMS (Oracle, SQL Server)

ArcGIS Online front-end, Managed Services back-end

Common business drivers…

Outsource Operations

- Don’t have the skills?
- Want to focus your resources elsewhere?
- Does your technology strategy dictate a “cloud first” roadmap?

Evaluate Capabilities

- Want to evaluate either the capabilities of the cloud technology or software?

Esri Managed Cloud Services

Expanded Competencies

Advise
- Cloud Architecture
- Cloud readiness
- Cloud roadmap

Enable
- Apps and/or data
- Industry capabilities
- Training

Proofs of Concept

Migrate
- Map migration services
- Data migration services
- App migration services

Customer Managed
- Data Content Hosting
- Customer App
- Sandbox/ Dev/ Prototype
- Cloud optimization services

No SLA

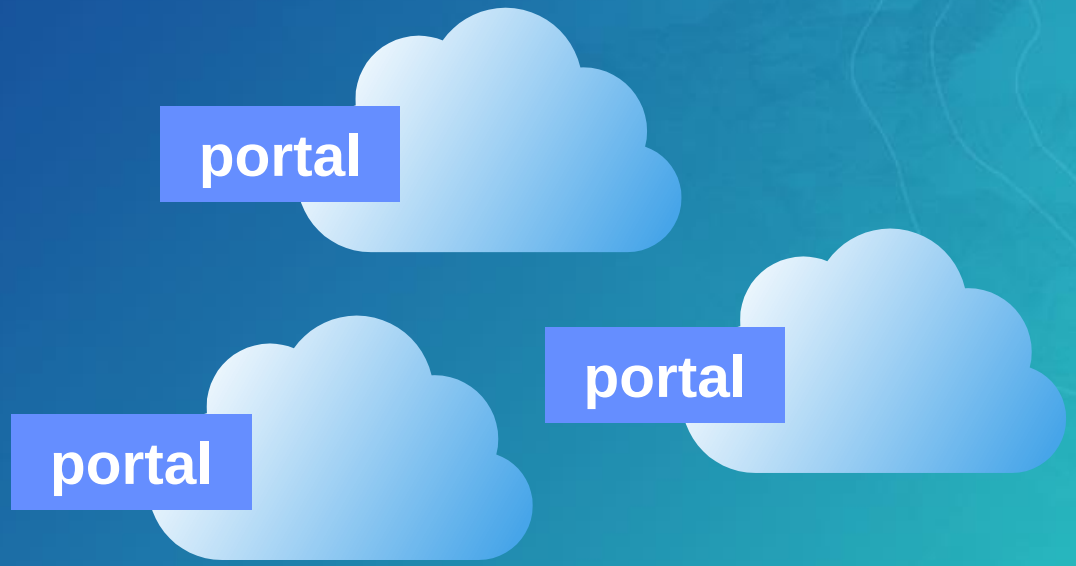
Esri Managed
- Data Content Hosting
- Customer App
- Outsourced GIS Operations
- Product as a Managed Service

Target SLA

Portal Architecture Options

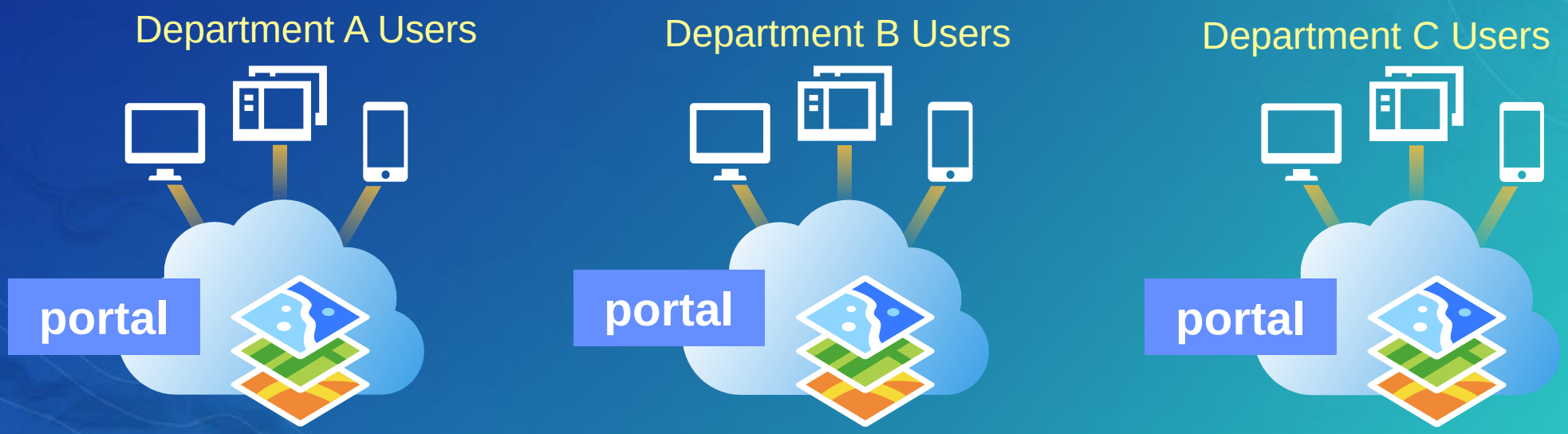
One or multiple portals

One Portal

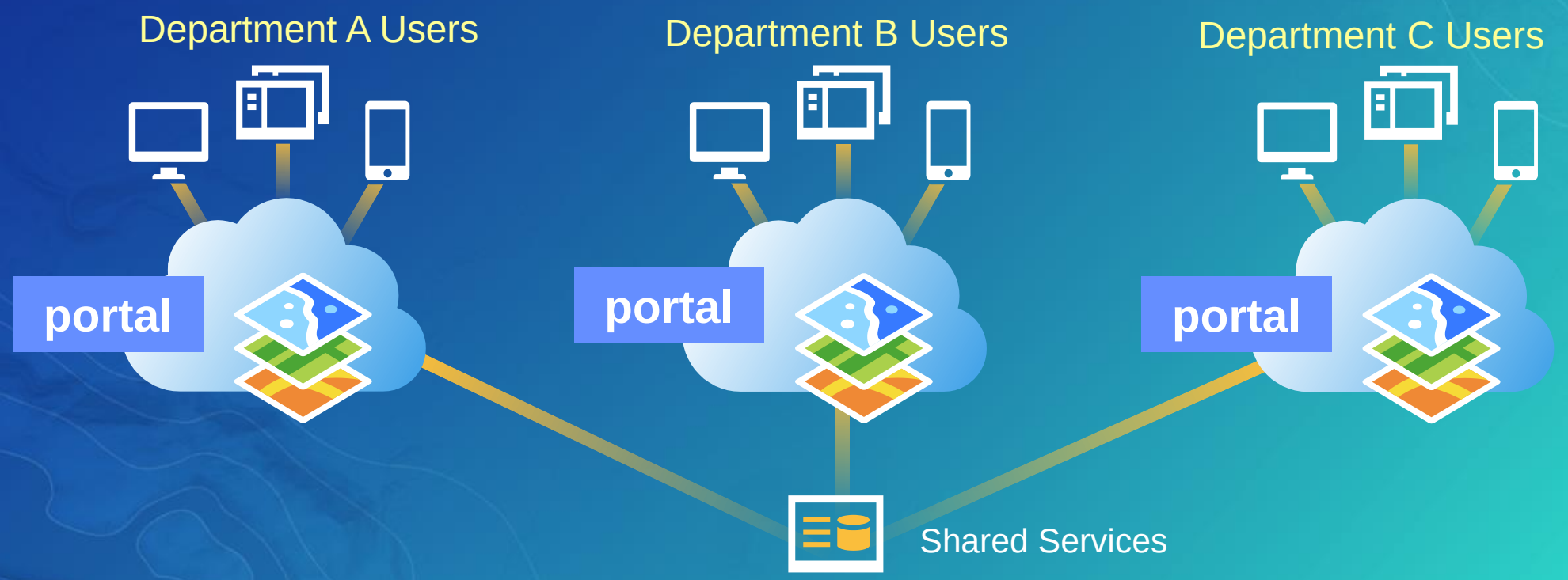


Many Portals?

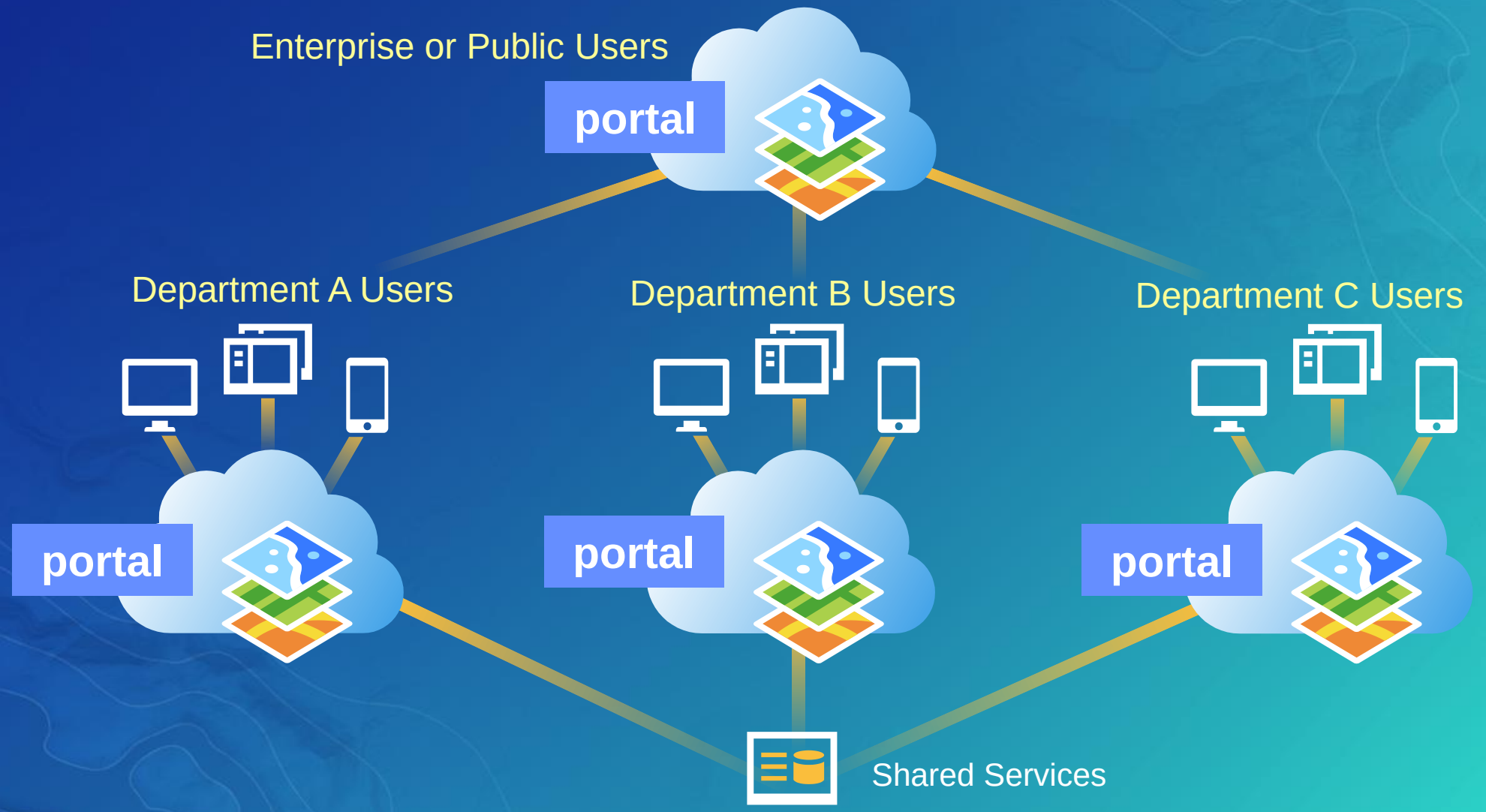
Portal Architecture Options



Portal Architecture Options

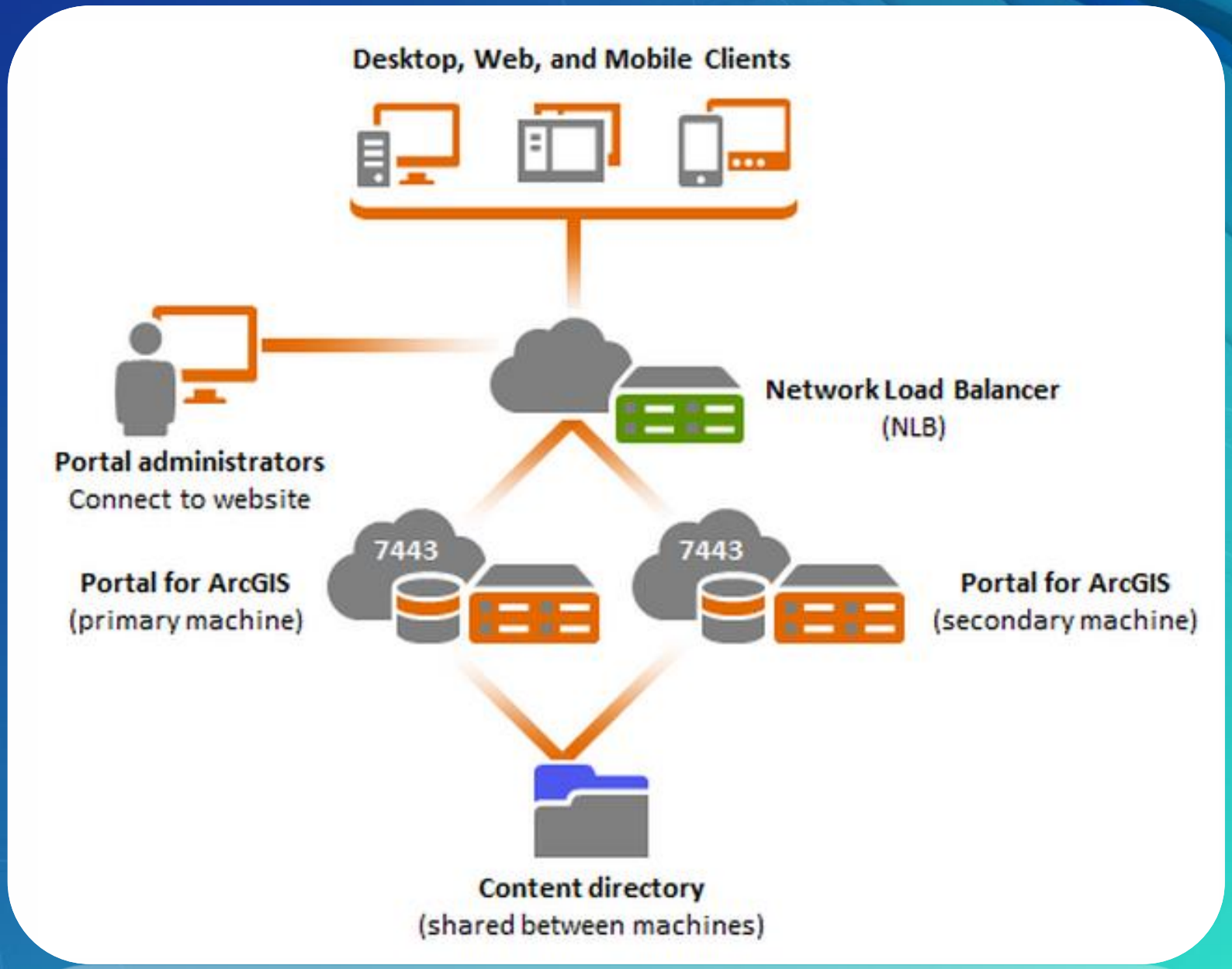


Portal Architecture Options



High Availability

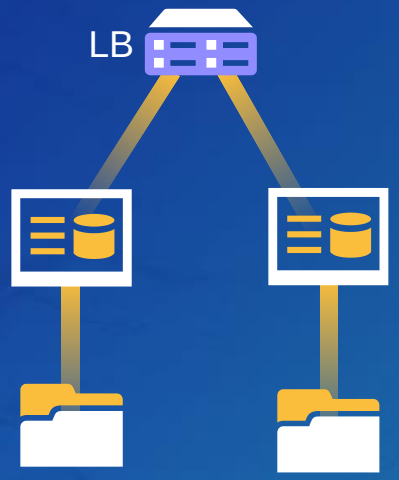
3rd party load balancer



ArcGIS Server Architecture Options

Silos, Sites & Clusters

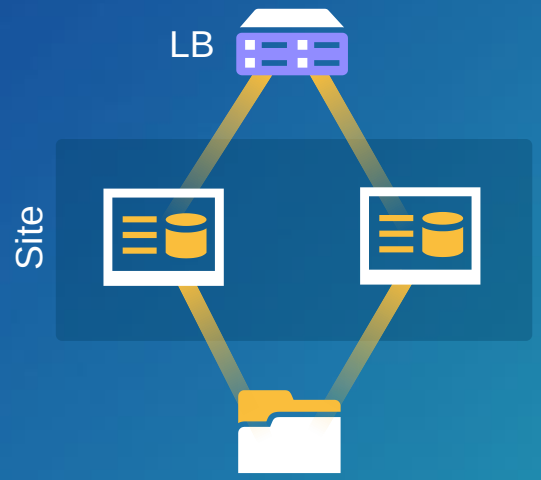
Silo



Configuration Stores

Site

recommended

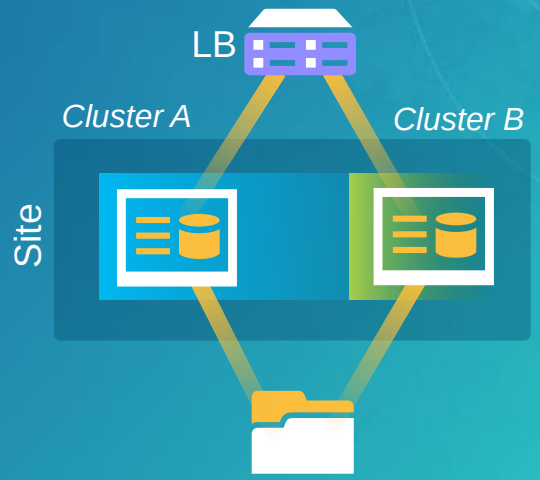


Configuration Store

(shared)

Cluster

To be deprecated



Configuration Store

(shared)

Use silos or small sites

Site design consideration

Multi-node, high number of services

- Ensure require infrastructure resources
  - Network stability
  - NAS stability for ArcGIS Server and Portal config stores
  - RAM
  - CPU
- Avoid during the working hrs:
  - Publishing high number services
  - Adding/removing nodes
- Distribute recycle times

Site management consideration

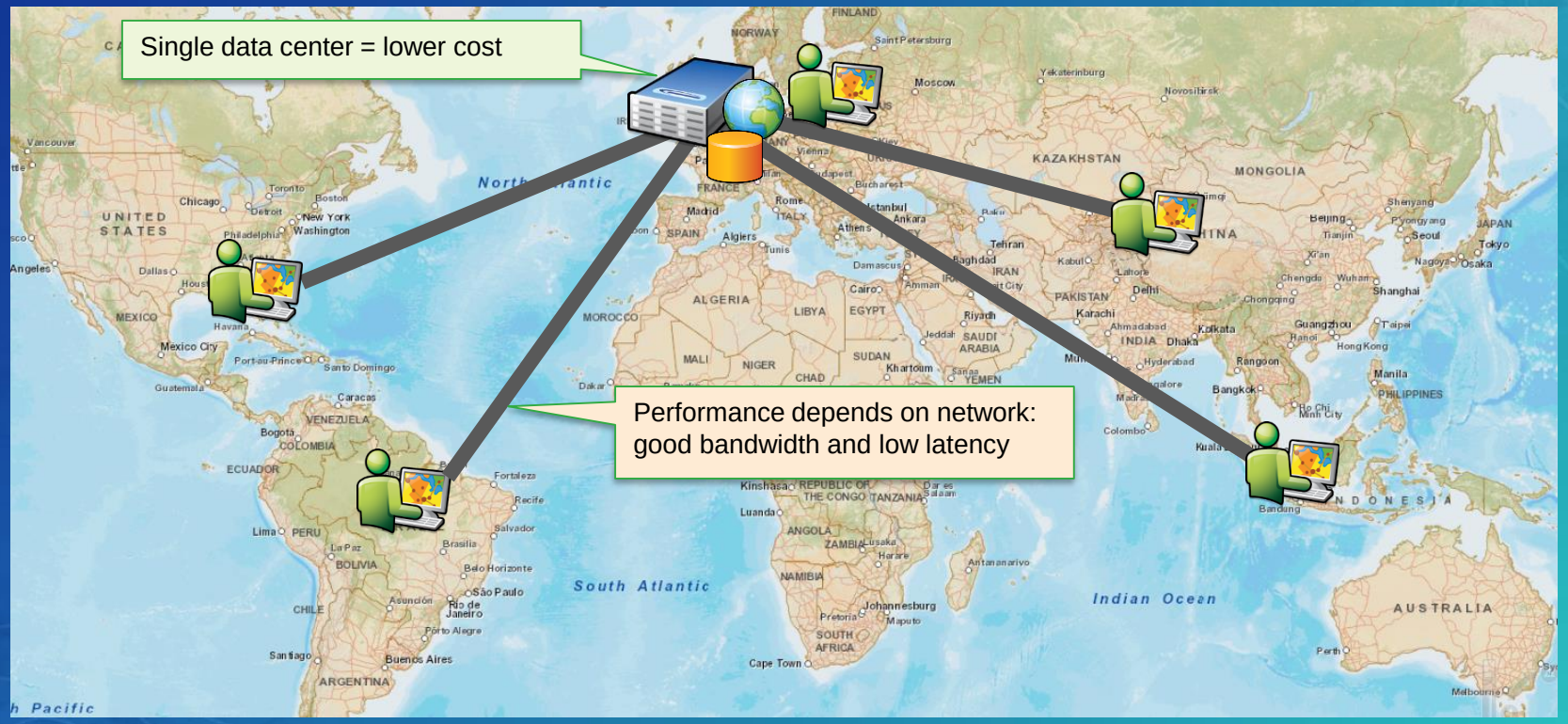
- Identify unused services and reduce min (to 0 if possible)
- Tune slow services
- Provide best practices to the publishers
- Monitor resources:
  - RAM and committed memory
  - CPU
  - Network latency

All available as part of System Monitor, https://systemmonitoring-emcs.esri.com/Portal

Data Architecture Options

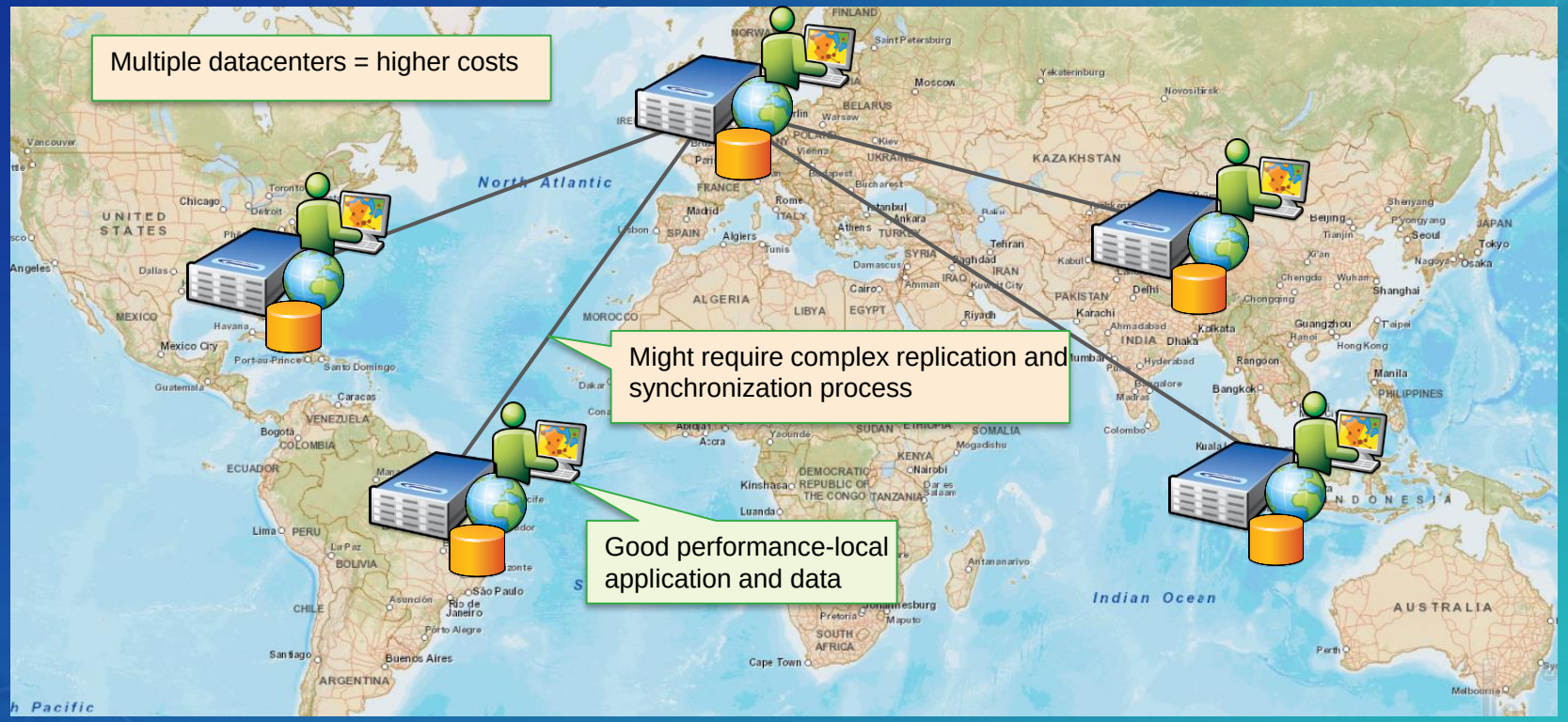
Data management strategy

Centralized



Data management strategy

Distributed



Data management strategy

- Geodatabase export / import
- RDBMS export / import
- RDBMS replication
- ETL Tools (e.g. FME, Informatica)
- Geodatabase replication

Performance Factors

Network transport time

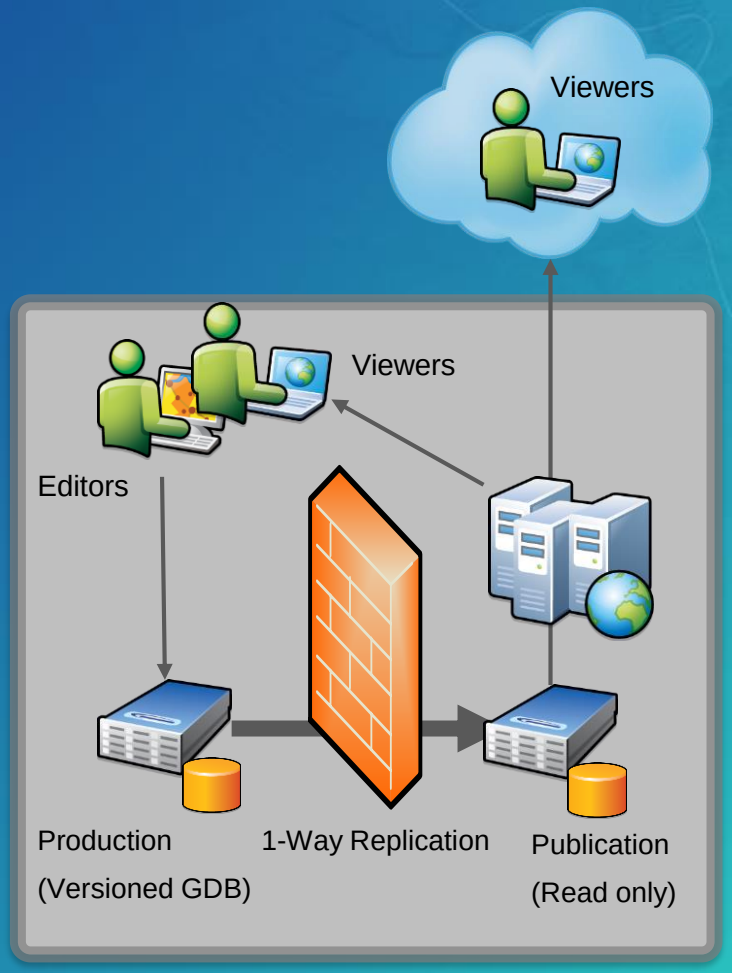
- **Impact of service and return type on network transport time**
  - **Compression**
  - **Content, e.g., Vector vs. Raster**
  - **Return type, e.g., JPEG vs. PNG**

					Network Traffic Transport Time (sec)					
					56 kbps	1.54 Mbps	10 Mbps	45 Mbps	100 Mbps	1 Gbps
Application Type	Service/Op	Content	Return Type	Mb/Tr	0.056	1.540	10.000	45.000	100.000	1000.000
ArcGIS Desktop	Map	Vector		10	178.571	6.494	1.000	0.222	0.100	0.010
Citrix/ArcGIS	Map	Vectror+Image	ICA Comp	1	17.857	0.649	0.100	0.022	0.010	0.001
Citrix/ArcGIS	Map	Vector	ICA Comp	0.3	5.357	0.195	0.030	0.007	0.003	0.000
ArcGIS Server	Map	Vector	PNG	1.5	26.786	0.974	0.150	0.033	0.015	0.002
ArcGIS Server	Image		JPG	0.3	5.357	0.195	0.030	0.007	0.003	0.000
ArcGIS Server	Map Cache	Vector	PNG	0.1	1.786	0.065	0.010	0.002	0.001	0.000
ArcGIS Server	Map Cache	Vector+Image	JPG	0.3	5.357	0.195	0.030	0.007	0.003	0.000

Data management strategy

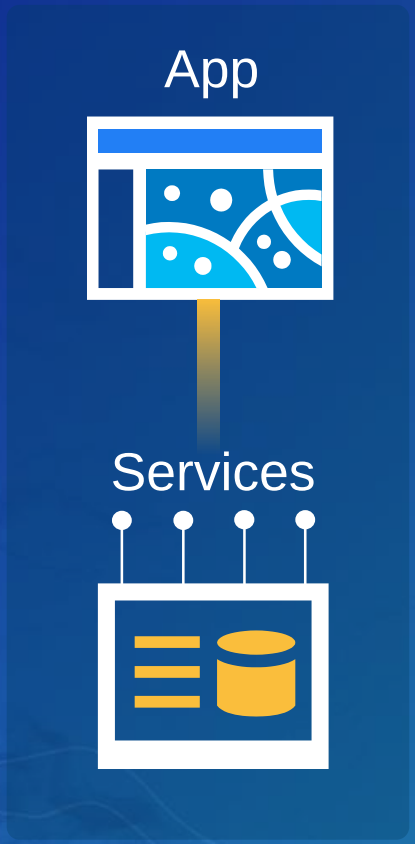
Production and Publication (external access)

- **Pros:**
  - Better security
  - Improved performance
  - Additional capacity
- **Cons:**
  - Requires replication
  - Additional hardware

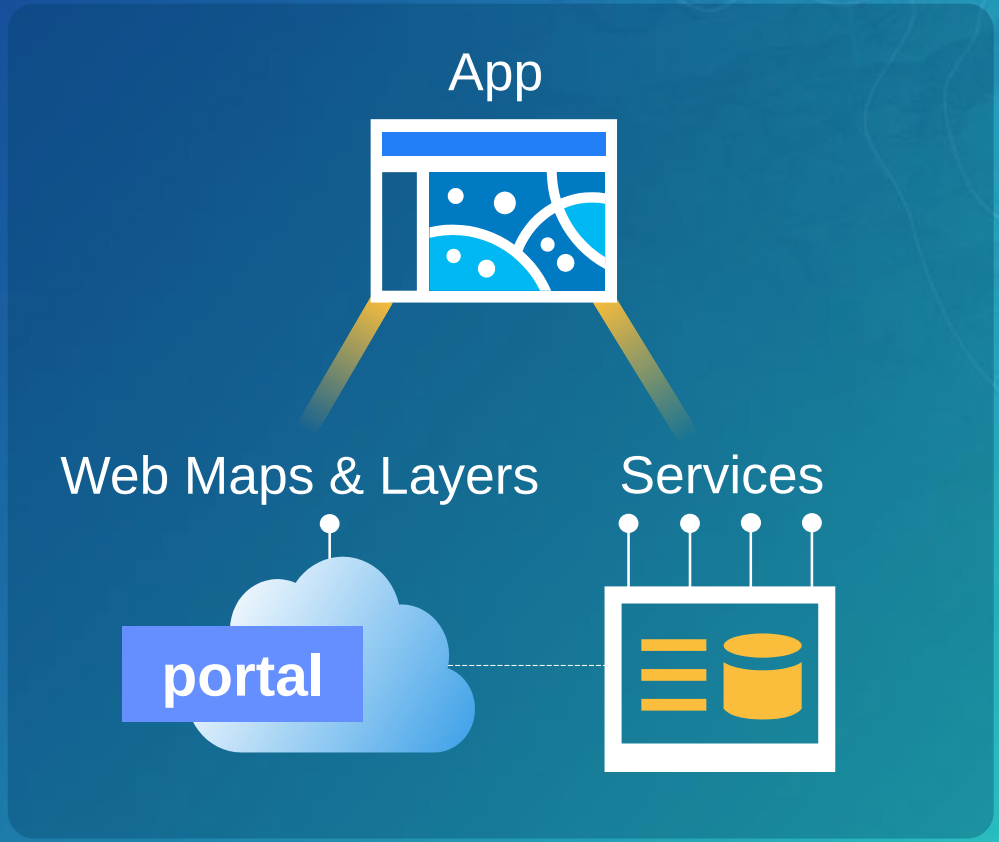


Publication Options

Server Pattern

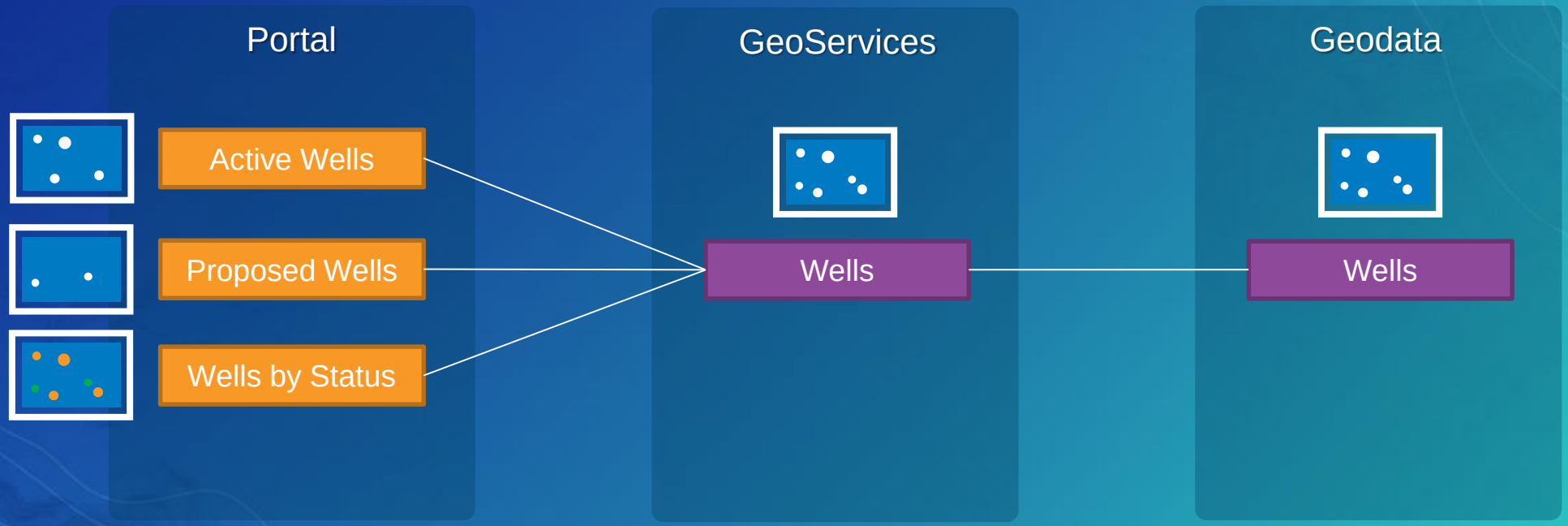


Web GIS Pattern



Publication Strategies

The Role of Portal & Web Layers



Hosting server

- **Scalable solution - can publish thousands of services**

Deployment best practices

Best Practices for Deployment

Plan Ahead

- Workload Separation
- DNS Aliases
- Follow Deployment Patterns
- Reduce Complexity
- Document Configurations

- Prototype
- Monitor Health

DNS Aliases

It is best when planning to provision DNS aliases in anticipation of adding additional servers or load balancers to the configuration.

DNS aliases decouples machine names and fully qualified domain names (FQDN) from the URL's and web entry points to the system.

Provide sufficient hardware resources

Most systems are CPU bound

GIS Systems are bound by:

1. **CPU - typically**
2. **Memory – when large number of services**
3. **Disk – Image Service, Synchronization**
4. **Network – low bandwidth deployment**
5. **Poorly configured virtualization can result in 30% or higher performance degradation**

Most well-configured and tuned GIS systems are CPU bound.

CPU capacity

1. User load: Concurrent users or throughput
2. Operation CPU service time (model)—performance
3. CPU SpecRate

$$\#CPU_t = \frac{ST_b \times TH_t \times 100}{3600 \times \%CPU_t} \times \frac{SpecRatePerCPU_b}{SpecRatePerCPU_t}$$

subscript t = target
subscript b = benchmark
ST = CPU service time
TH = throughput
%CPU = percent CPU

Network capacity

Network transport time

- **Required bandwidth**
  - **Response size**
  - **Number of transactions**

$$Mbps = \frac{TH \times Mbits/req}{3600}$$

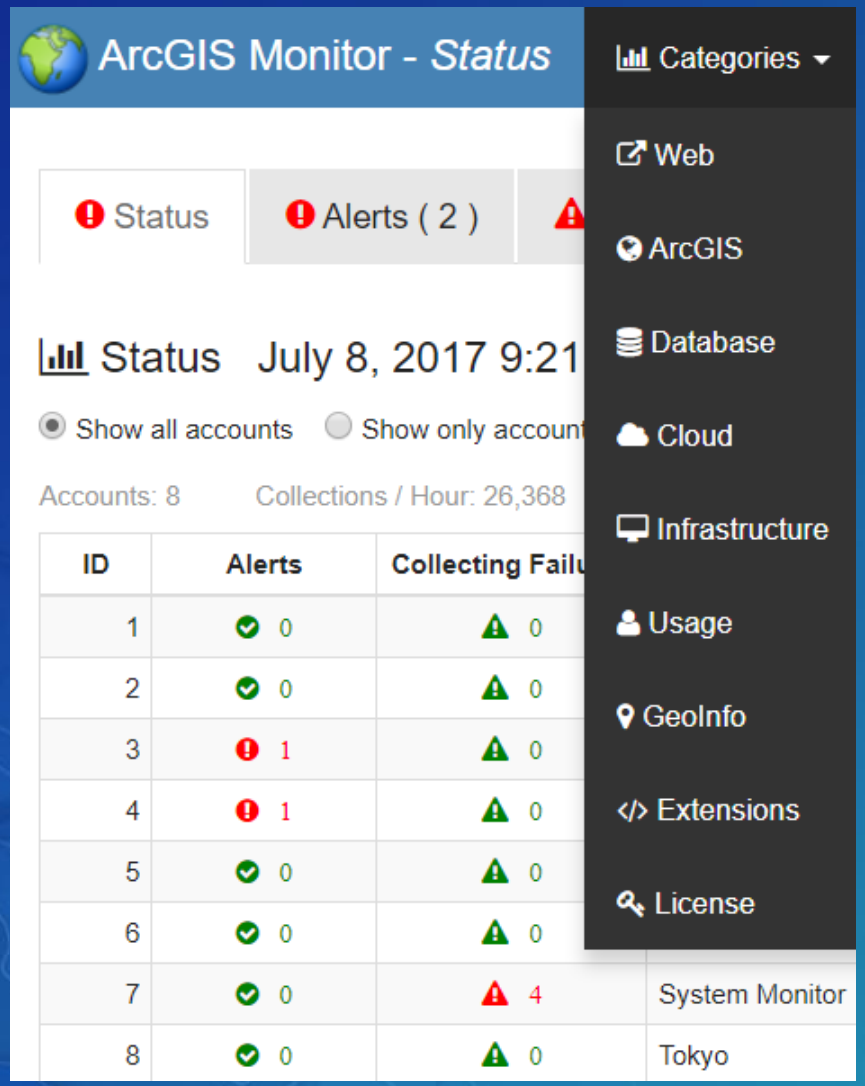
- **Network transport time**
  - **Response size**
  - **Effective bandwidth**

$$Transport(\sec) = \frac{Mbits/req}{Mbps - Mbps_{used}}$$

All Built into System Designer

Monitor

Full stack monitoring

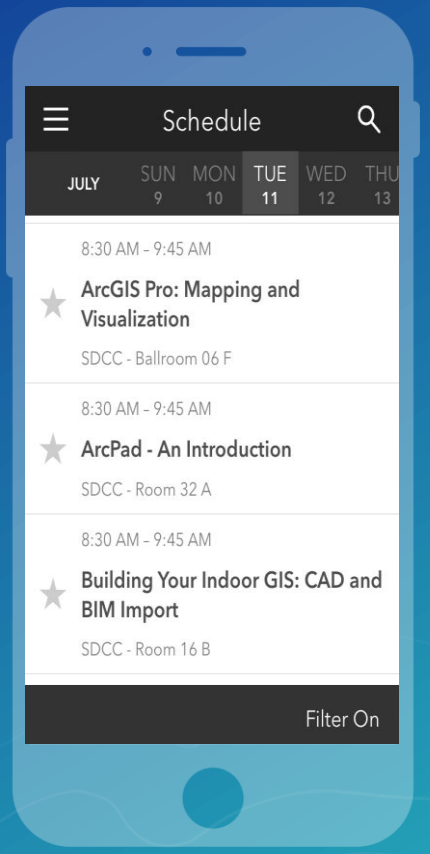


http://go.esri.com/monitor

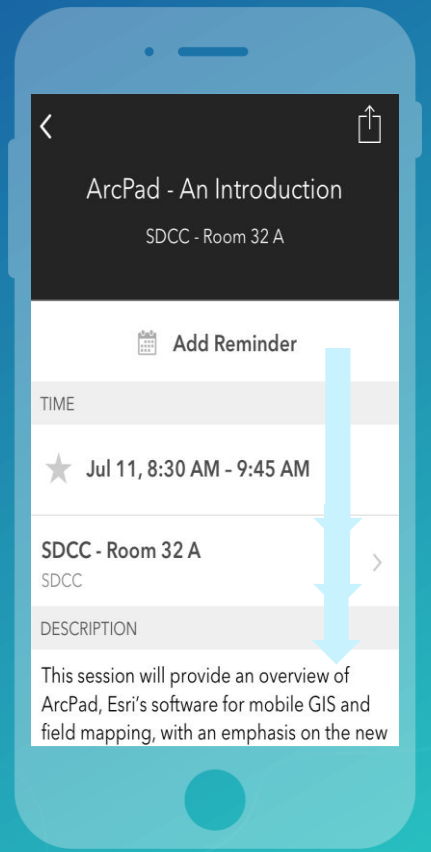
Thank you for Attending.
Please Take Our Survey on the **Esri Events App!**

Download the Esri Events app and find your event

Select the session you attended



Scroll down to find the survey



Complete Answers and Select "Submit"