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ArcGIS GeoEvent Extension for Server: Best Practices

Gary Sheppard
Solution Engineer
Esri
gsheppard@esri.com

C. Adam Mollenkopf
Product Lead
Esri
amollenkopf@esri.com
@amollenkopf

Live Data: Ubiquitous, Plenteous

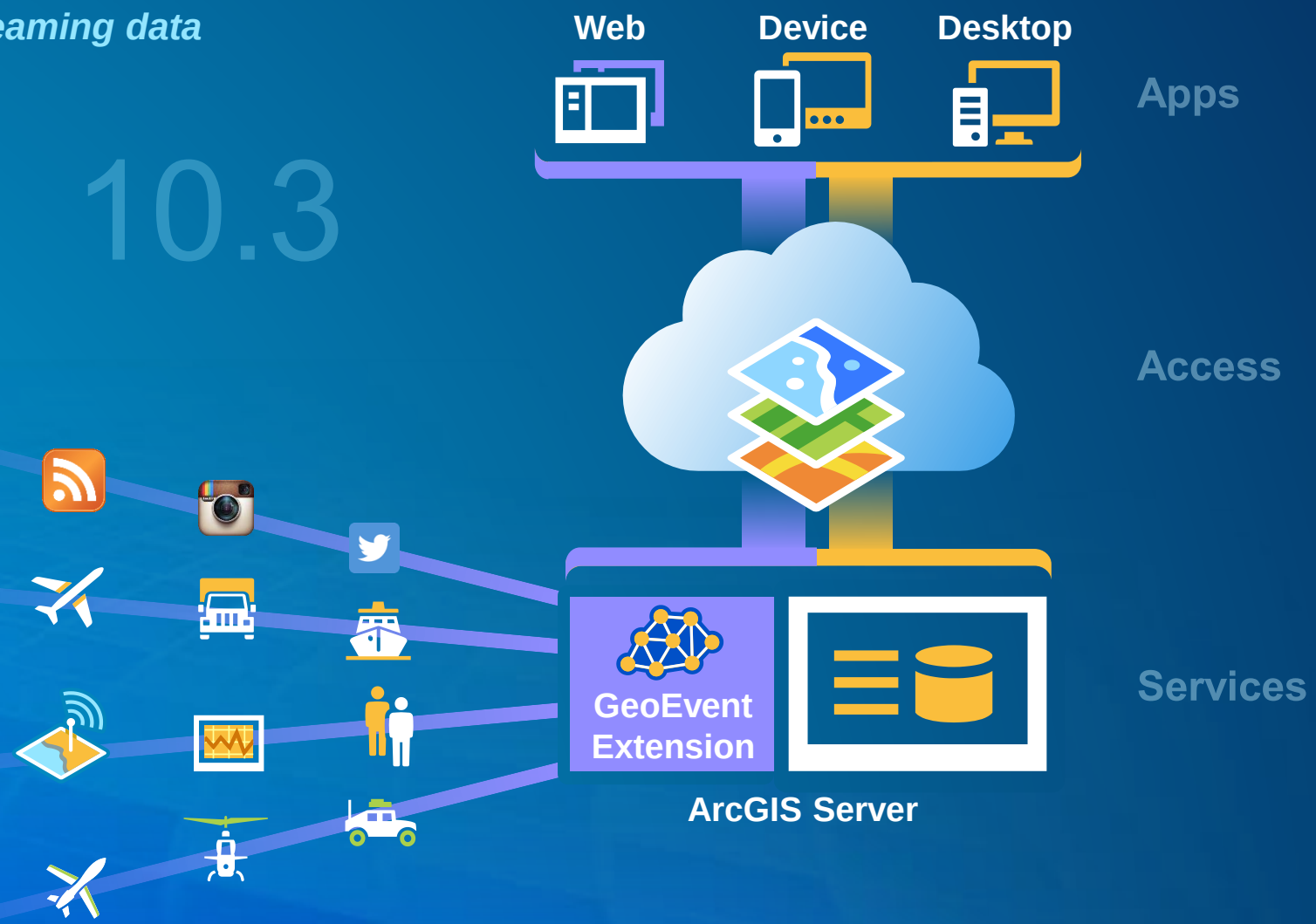
- **Internet of Things (excluding PCs, phones, and tablets)**
  - **2009: 0.9 billion devices**
  - **2020: 26 billion devices**
  - ***Source: Gartner***
- **Total amount of digital data created**
  - **2010: 1.2 zettabytes**
  - **2013: 4 zettabytes**
  - **2020: 35 zettabytes**
  - **(Zettabyte = 1 billion terabytes)**
  - ***Sources: IDC, VSAT Voice***

Real-Time GIS

Integration and exploitation of streaming data

10.3

- Integrates real-time streaming data into ArcGIS
- Performs continuous processing and real-time analytics
- Sends updates and alerts to those who need it where they need it



“I built my own system to handle live data.
It was easy and it’s awesome.”

No one ever

Benefits of GeoEvent Extension

- We've built what's hard about live data handling
- You build what's specific to you (the easy part!)
- We'll fully support you
- Let us show you some best practices...

Agenda

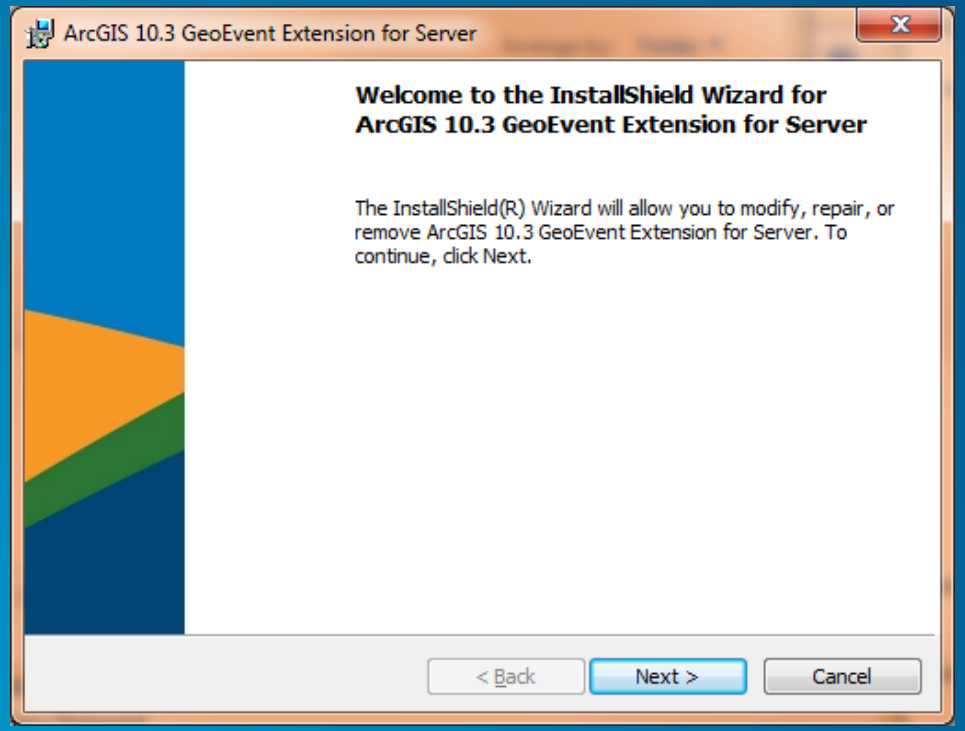
- Getting started
- Basic configuration
- Filtering and processing
- Real-time in web maps
- Security
- Performance
- High availability and scalability

Getting Started

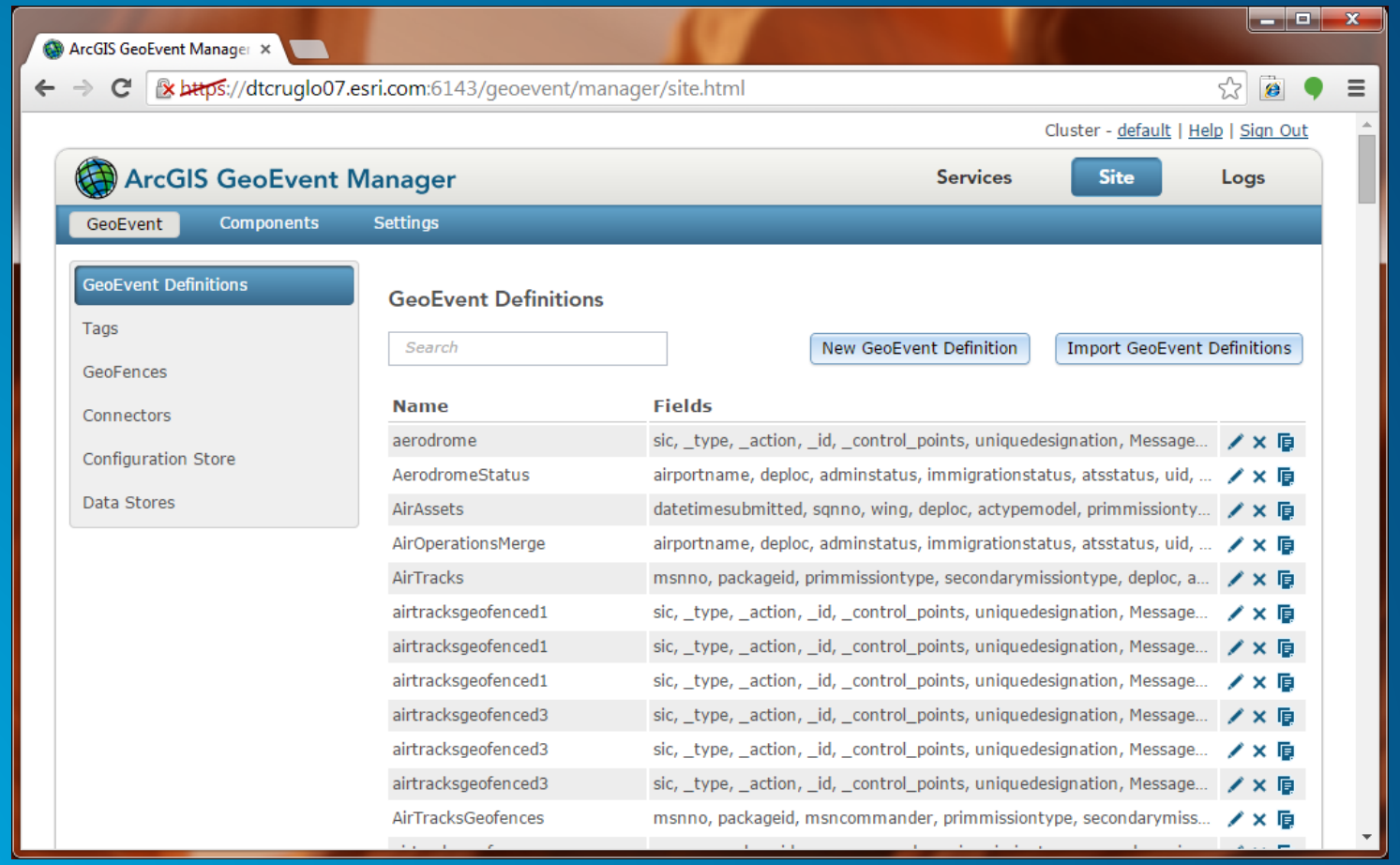
How to Get GeoEvent Extension

- Now (getting started):
  - Check to see if your organization already has it
  - Or subscribe to Esri Developer Network (EDN)
- Later (when you deploy):
  - Purchase it if you don’t have it yet
  - It’s an extension to ArcGIS for Server

Installation and Configuration



Installation and Configuration



Best Practices for Getting Started

- GeoEvent tutorials on ArcGIS.com

Better Together

- GeoEvent Extension
- Operations Dashboard

Live Data

Demo:

- GeoEvent Manager
- Operations Dashboard

Basic Configuration

GeoEvent Definitions

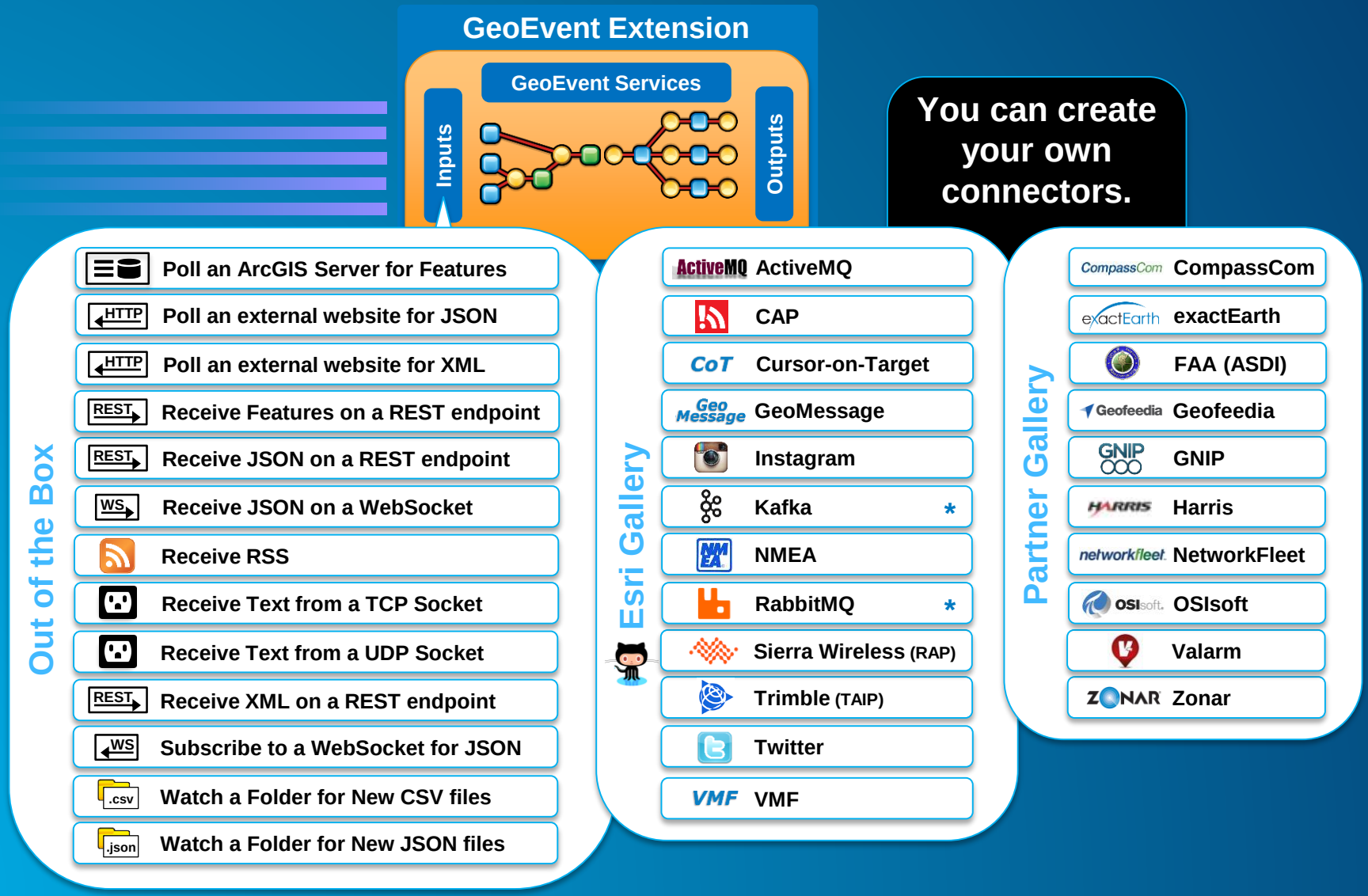
- Schema for GeoEvents
- Reusable
- Create by hand or import from feature service

Best Practices for GeoEvent Definitions

- Import from feature service
  - Avoid creating by hand
- Treat as a contract
  - Don’t edit unless you absolutely must

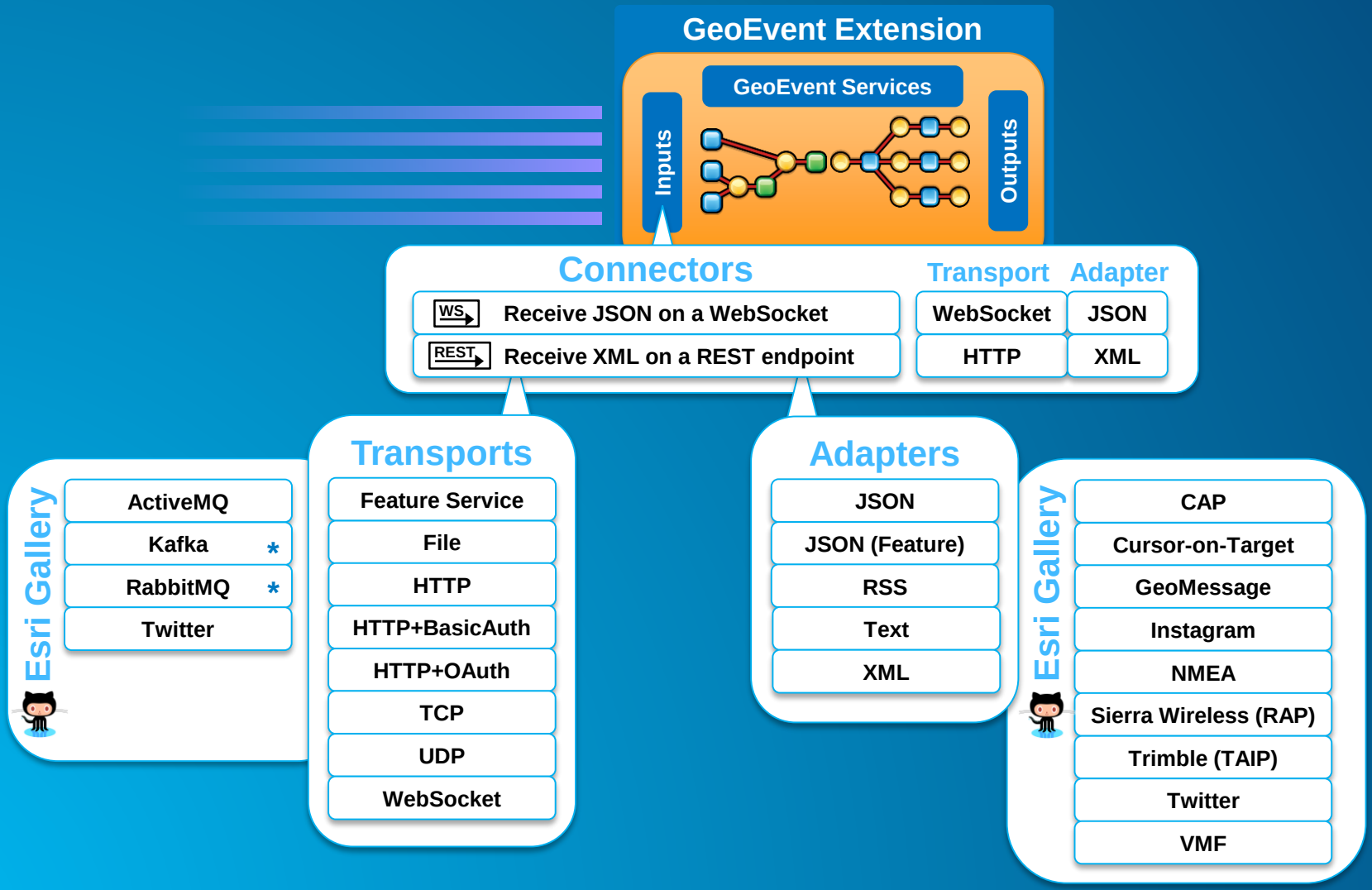
Receiving Real-Time Data

Easily integrate real-time streaming data into ArcGIS using an Input Connector



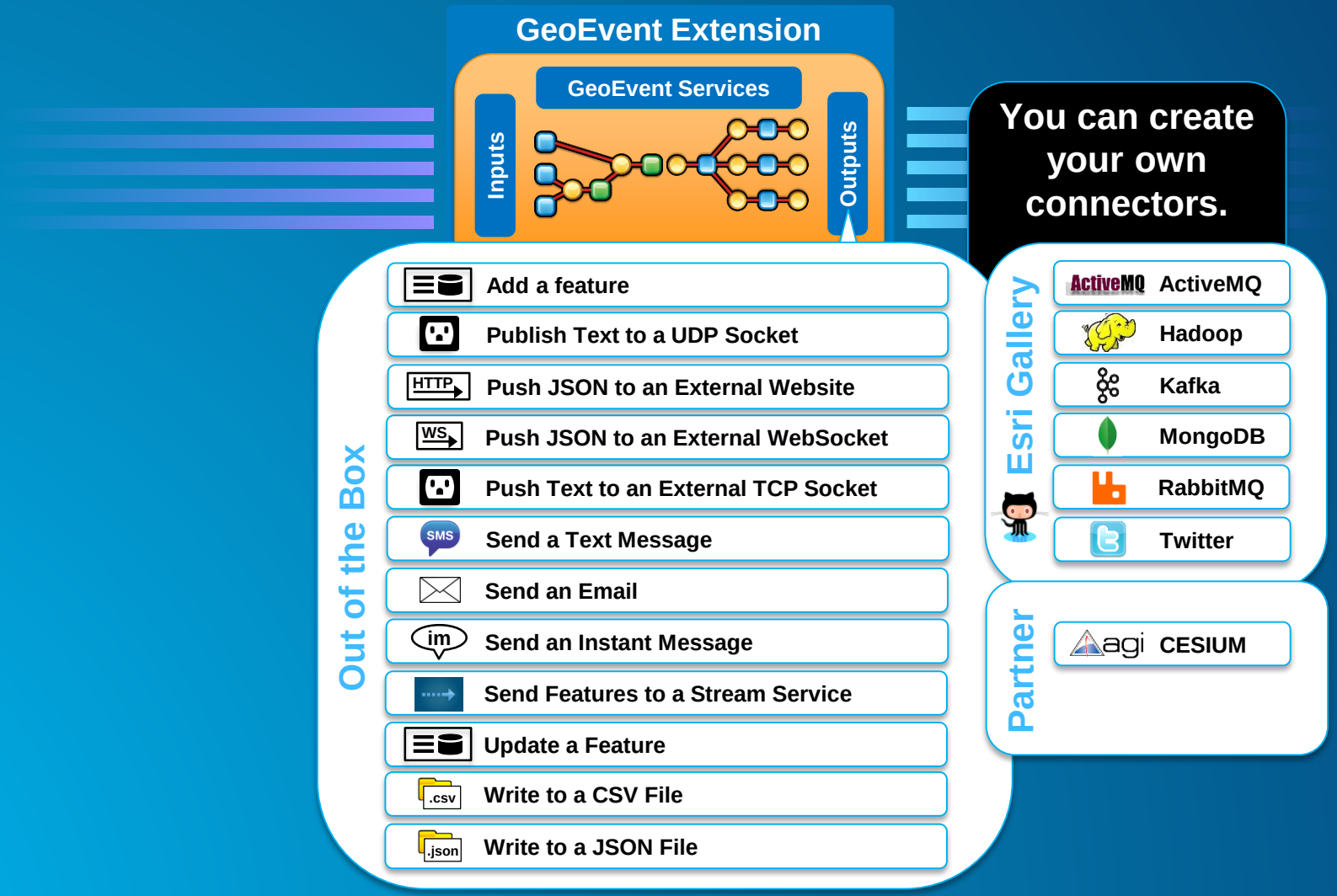
Receiving Real-Time Data

Input Connector = Transport + Adapter



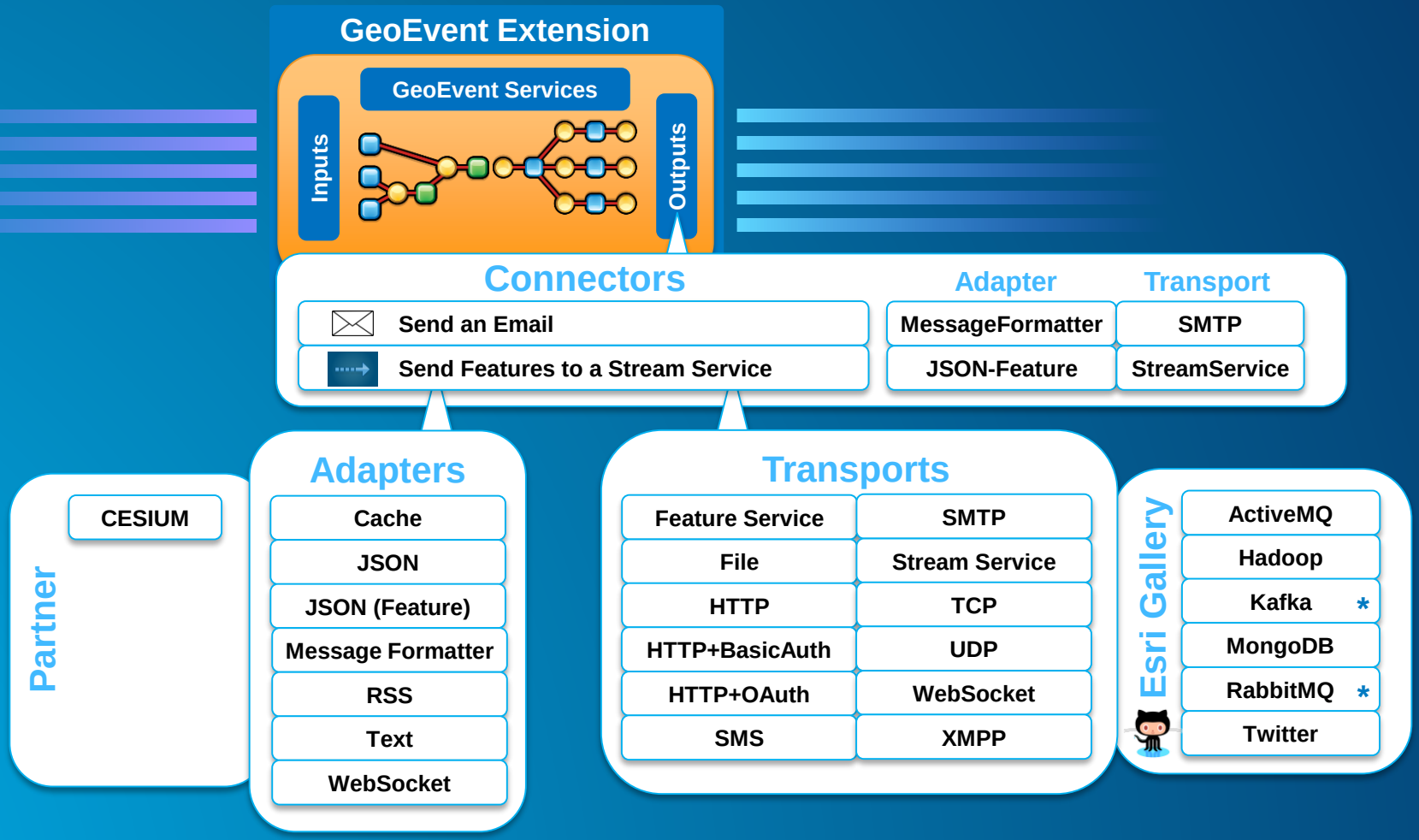
Sending Real-Time Data

Easily disseminate notifications, alerts, and updates using an Output Connector



Sending Real-Time Data

Output Connector = Adapter + Transport



Best Practices for Adapters and Transports

- Use included adapters and transports if possible
- Use GeoEvent SDK if necessary to build your own (Java)
  - If you do, try to make them generic

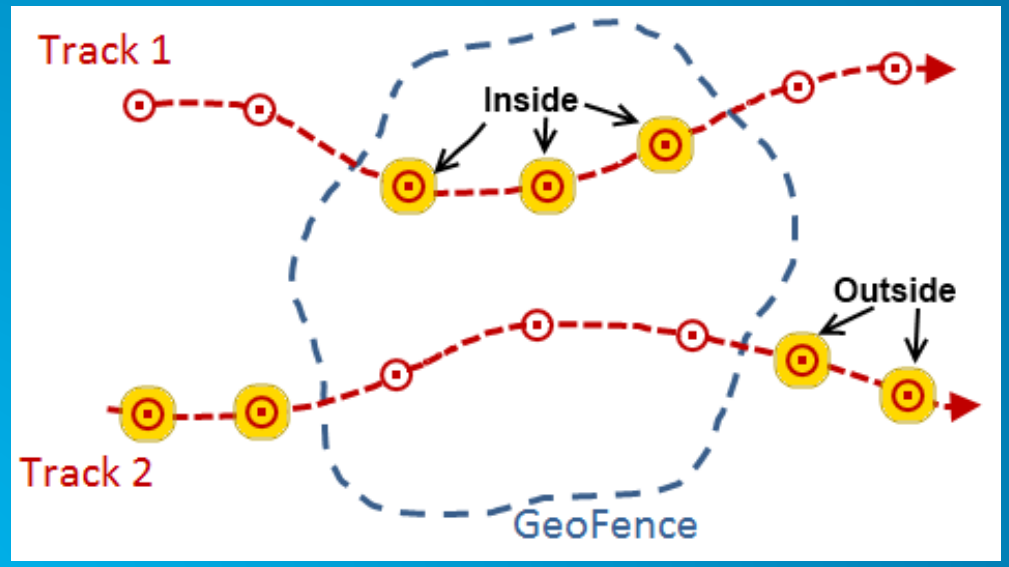
Best Practices for Connectors

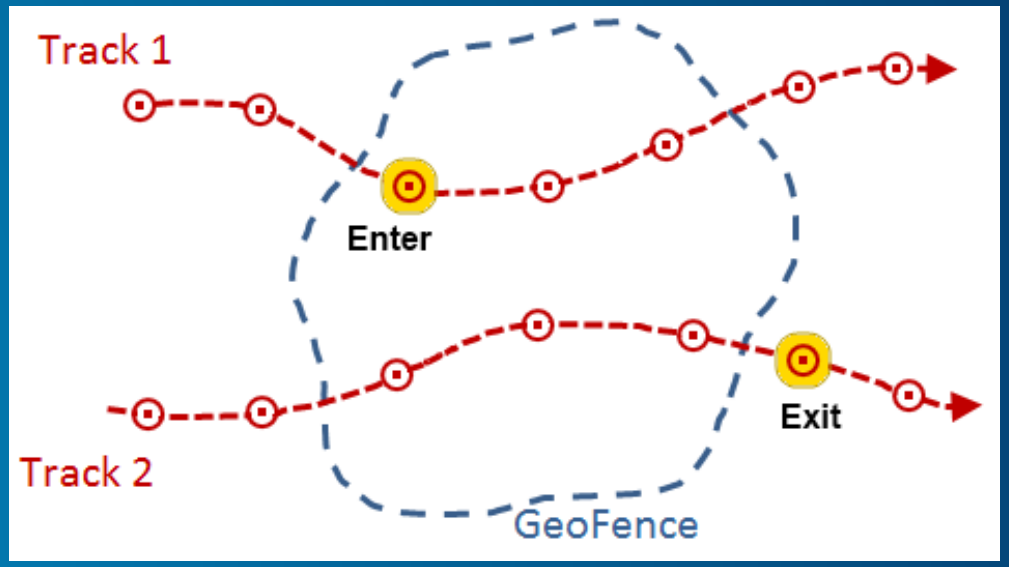
- “Incoming Data Contains GeoEvent Definition”: careful! (Demo)
- Use included connectors when possible
- Configure new connectors if needed (no code)
  - Make them generic if possible
- Remember:
  - Connector = Adapter + Transport
- Try solutions-geoevent-java repository

Filtering and Processing

Filtering GeoEvents

- **Attribute filters**
- **Spatial filters (GeoFences)**
- **GeoEvent property filters (e.g. $DEFINITION_NAME and $RECEIVED_TIME)**

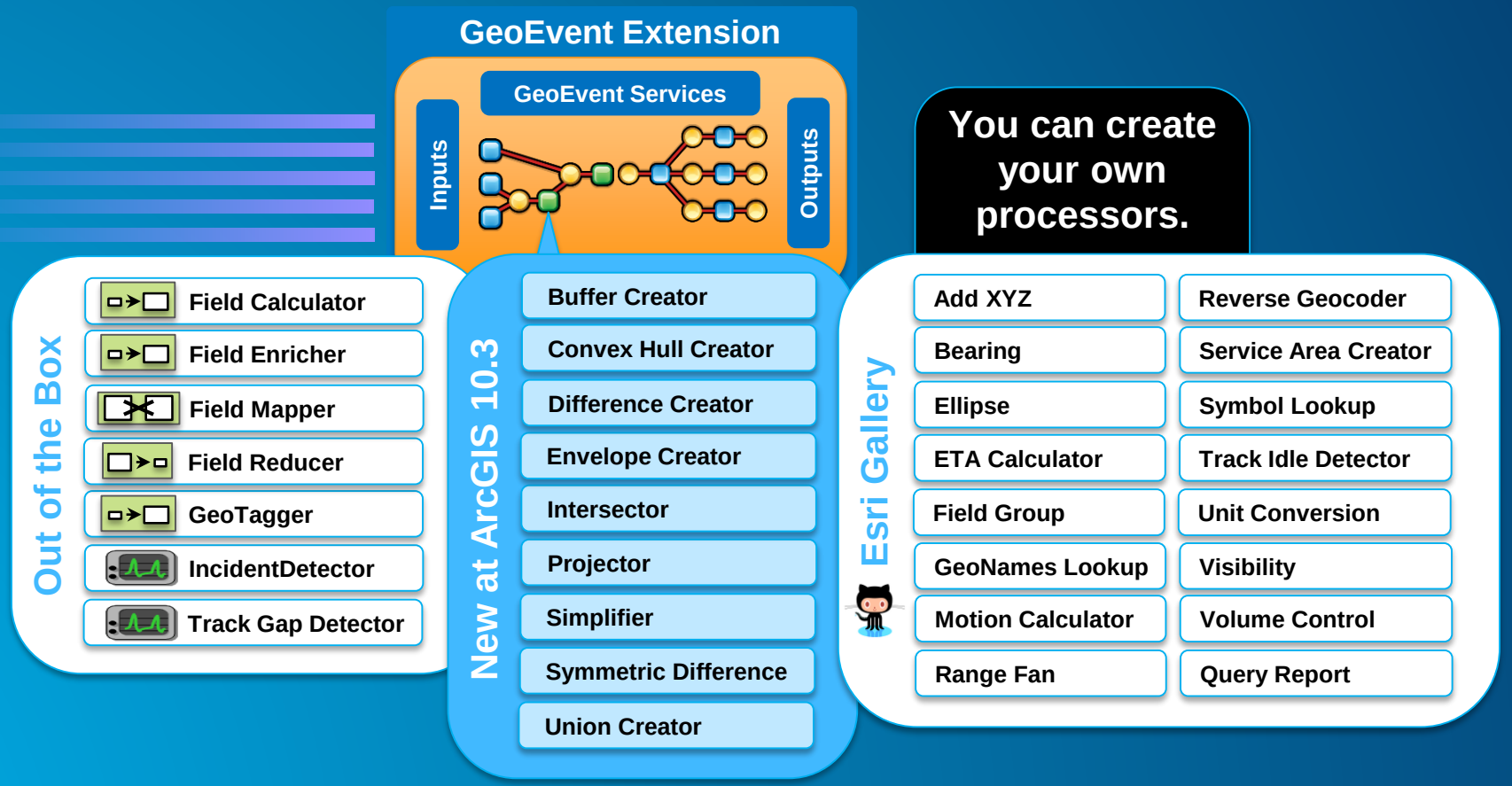




Applying real-time analytics

GeoEvent Processing

- You can perform continuous analytics on GeoEvents as they are received using a **processor.**



Best practice for processing GeoEvents

- **Use Field Reducer to avoid writing null values with Field Mapper**

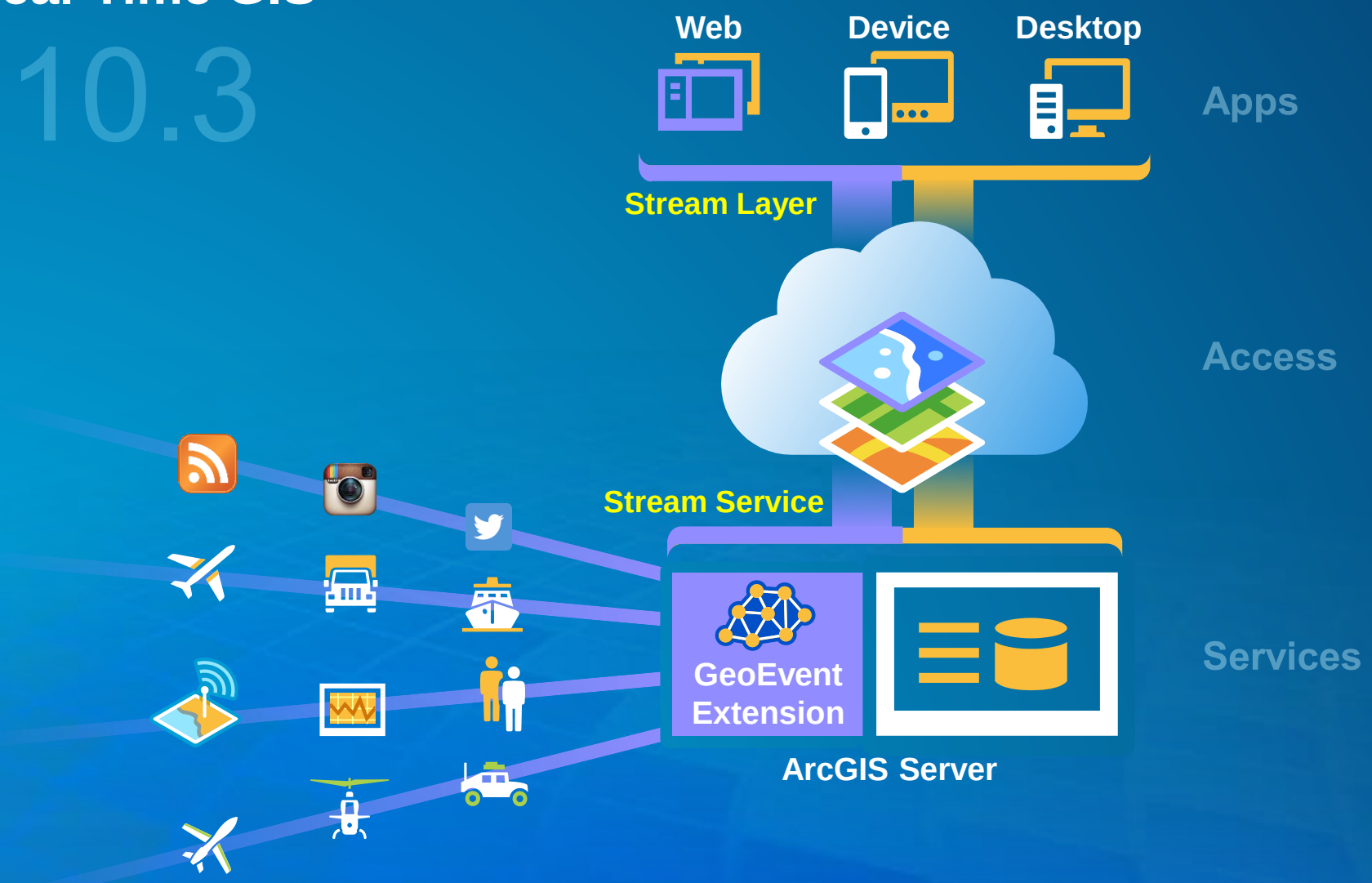
Real-Time in Web Maps

Real-Time GIS

10.2

Real-Time GIS

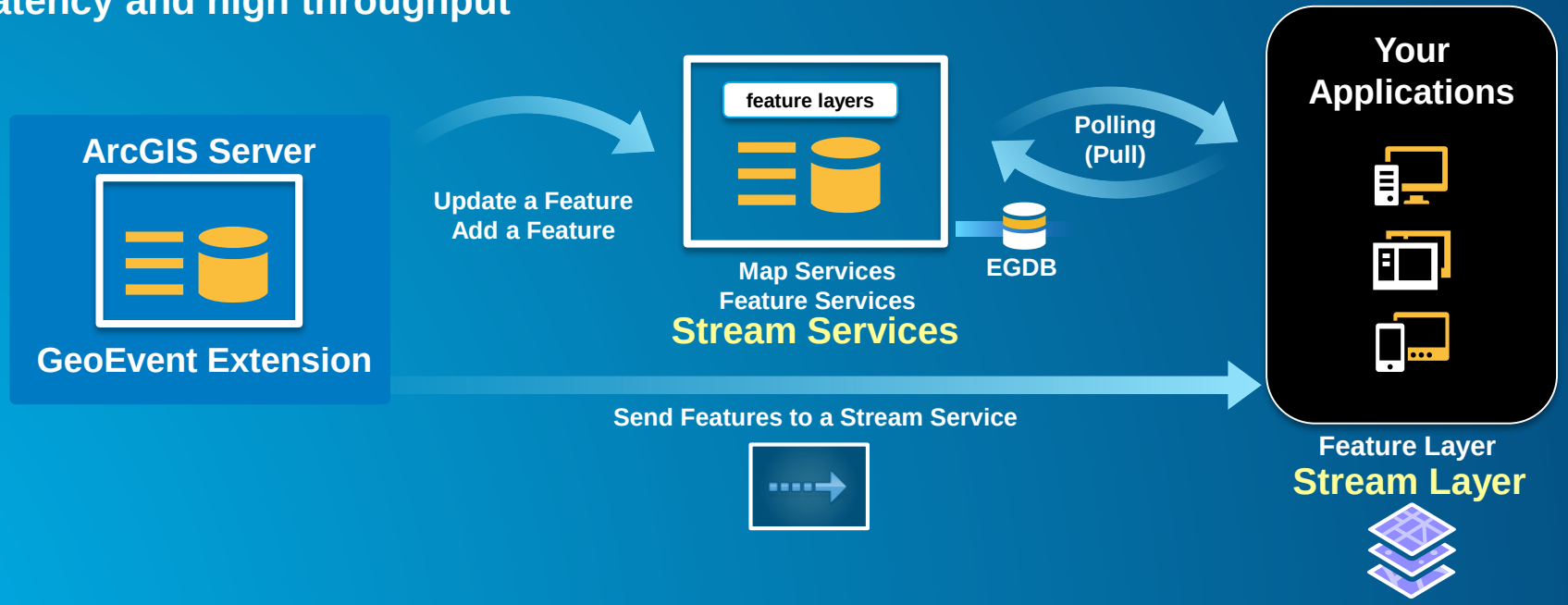
10.3



Getting Real-Time data into Web Apps

Two patterns

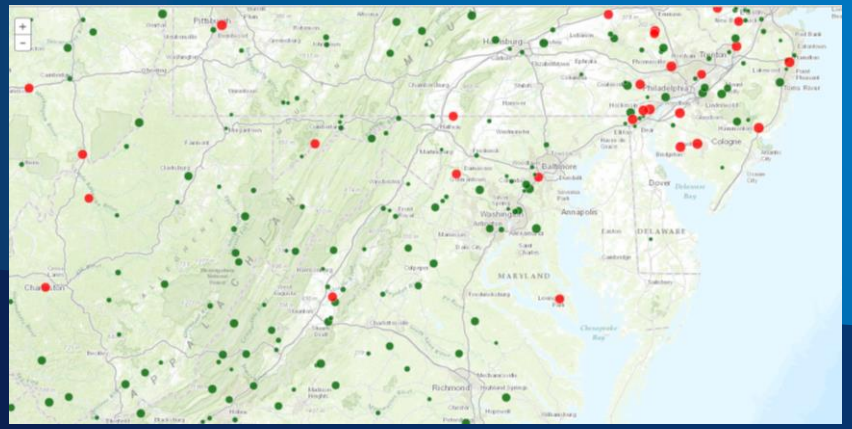
- Feature layers **pull** from feature services
  - Web apps poll to get periodic updates
  - Must be backed by an enterprise geodatabase (EGDB)
- Stream layers **subscribe** to stream services
  - Web apps subscribe to immediately receive data
  - Low latency and high throughput

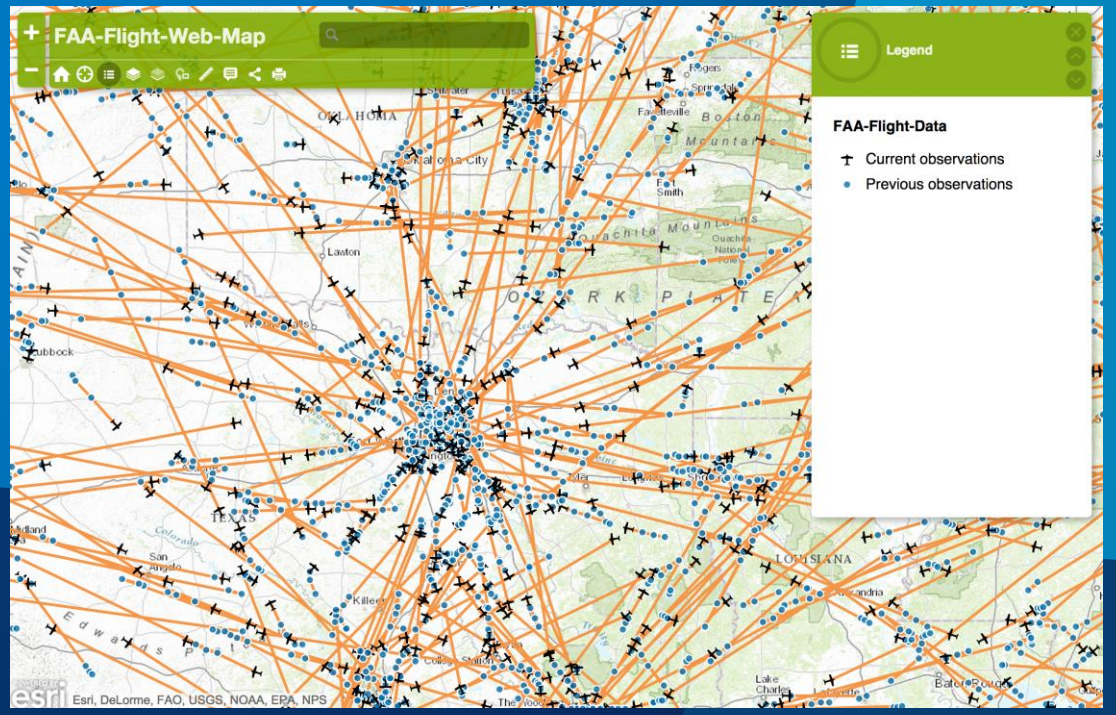


Demo

Real-Time in Web Maps

Stream Services





Real-Time GIS

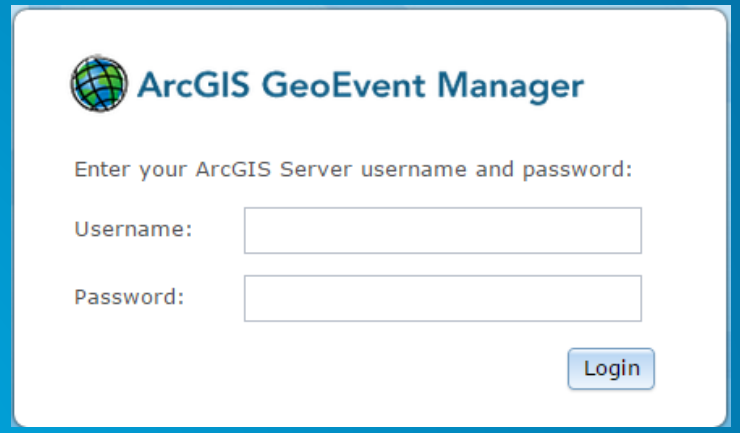
10.3

Security

Security @ 10.3

Integrated security with ArcGIS for Server and Portal for ArcGIS

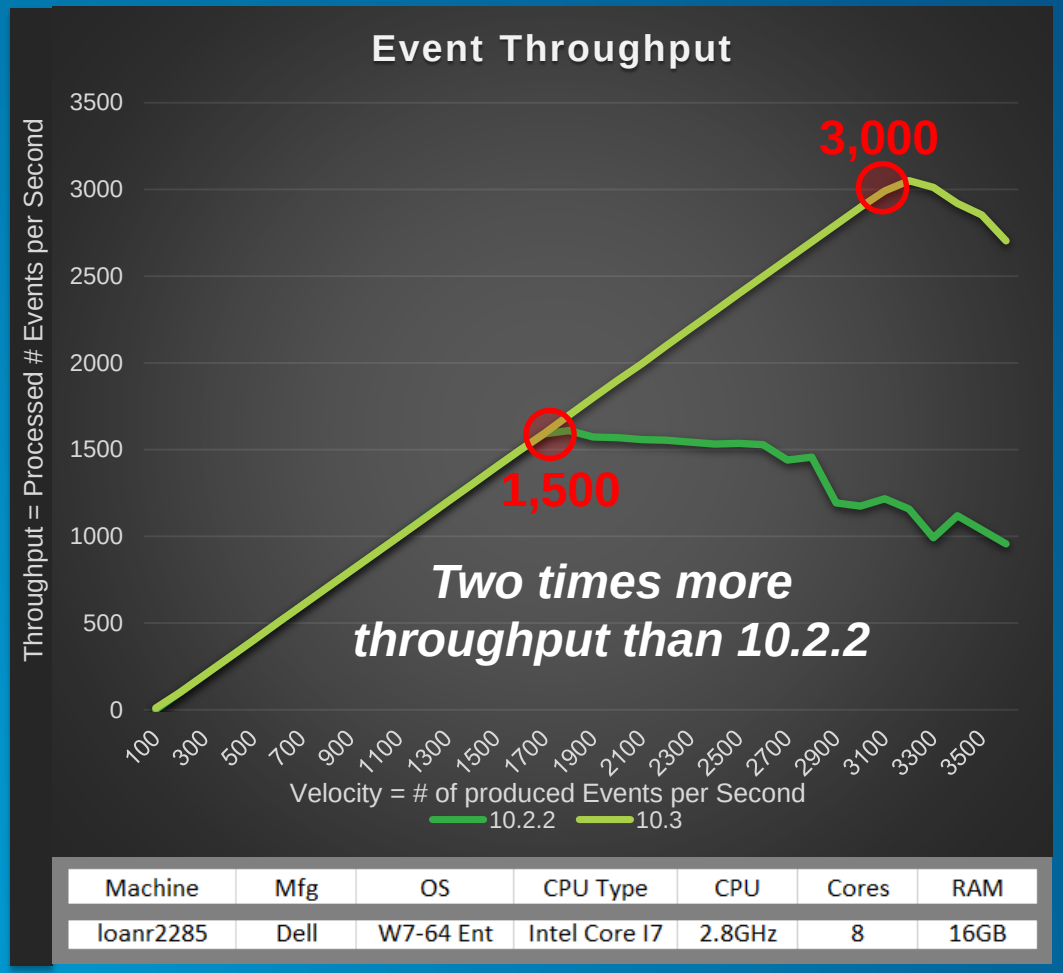
- **GeoEvent Manager**
  - **Uses the same credentials as ArcGIS for Server or Portal for ArcGIS**
  - **Recognizes Server/Portal roles – Administrators and Publishers**
- **SSL**
  - **GeoEvent utilizes SSL certificates that have been registered for ArcGIS for Server / Portal for ArcGIS**



Performance

Throughput Performance @ 10.3

Two times more throughput than 10.2.2

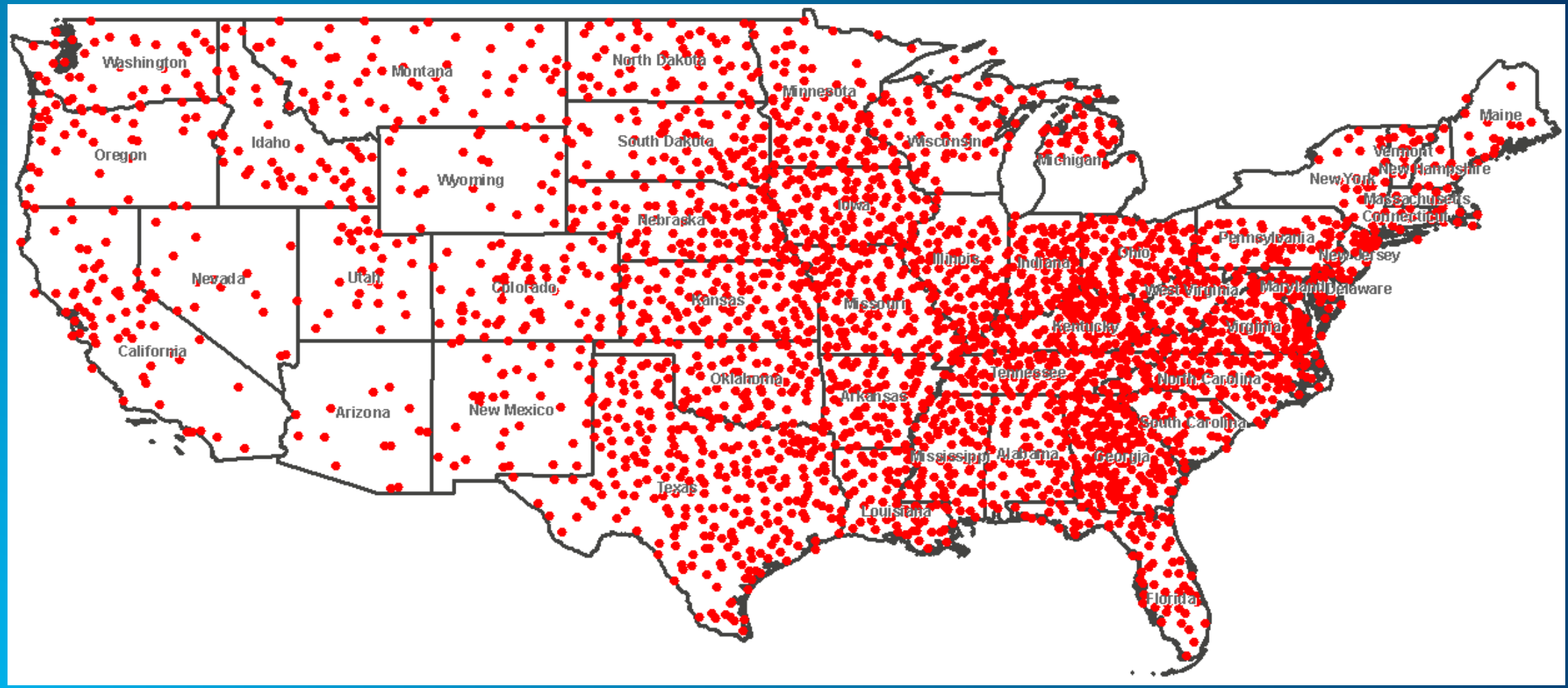


Machine	Mfg	OS	CPU Type	CPU	Cores	RAM
loanr2285	Dell	W7-64 Ent	Intel Core I7	2.8GHz	8	16GB

As captured on primary benchmarking machine using ArcGIS 10.3

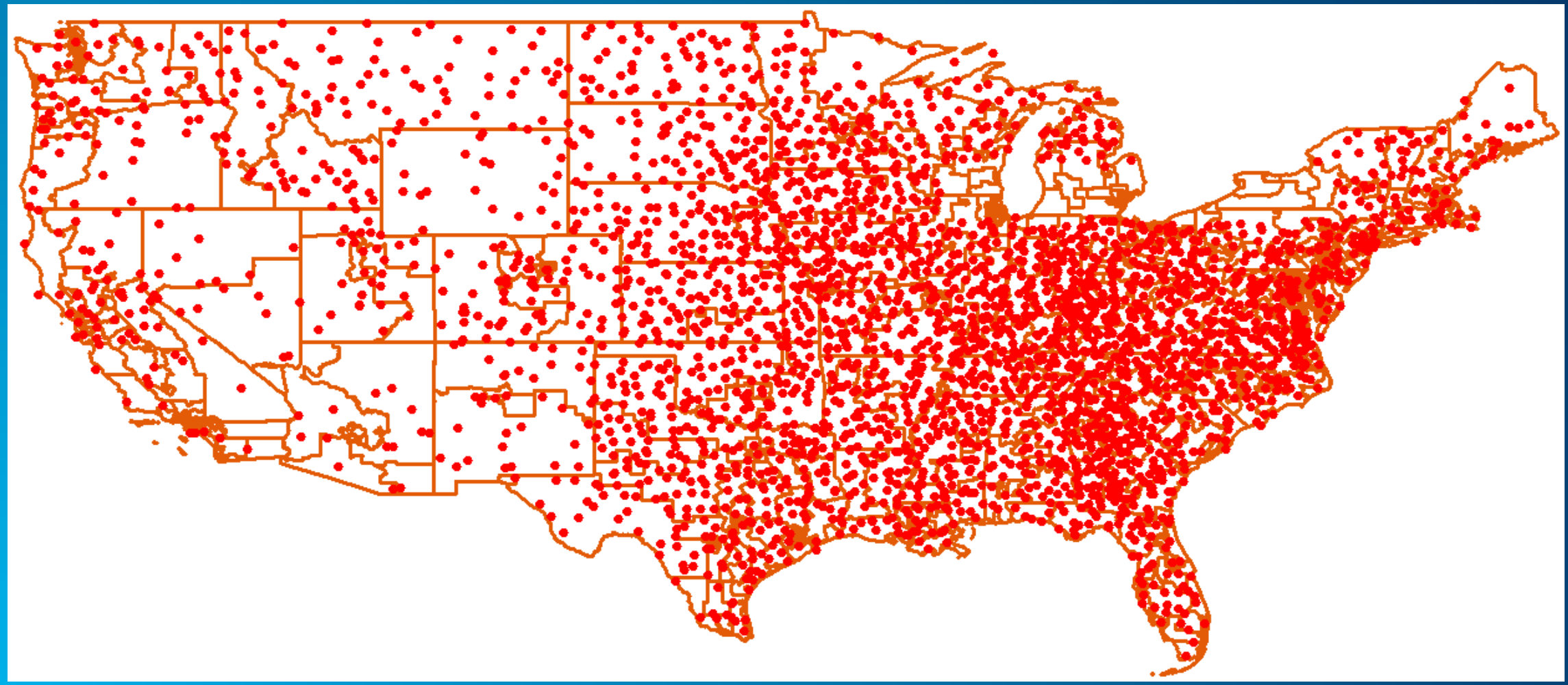
Geofencing Performance @ 10.3

US States benchmark – 51 geofences with 1,617 vertices on average (78 min / 21,970 max)



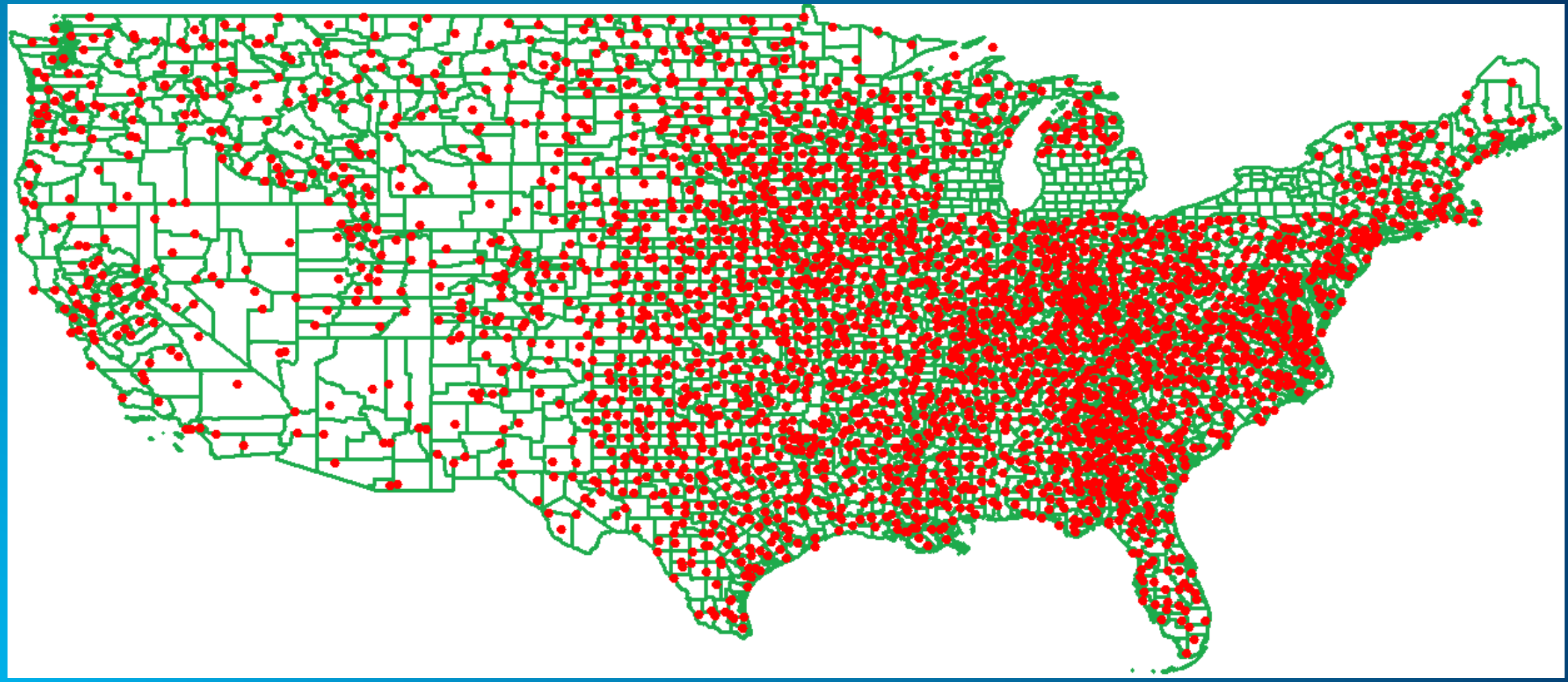
Geofencing Performance @ 10.3

US Congressional Districts benchmark – 436 geofences with 512 vertices on average (24 min / 7,285 max)



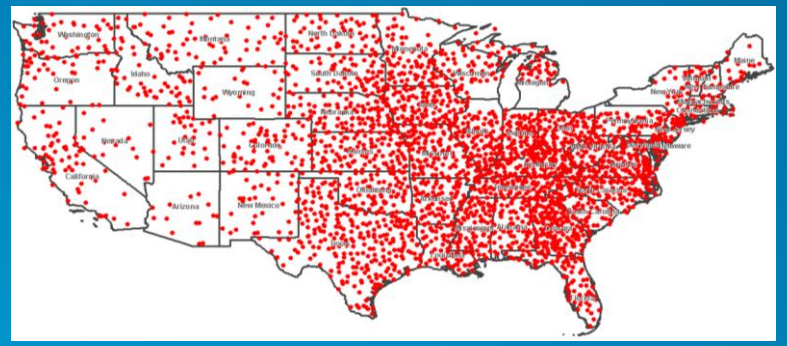
Geofencing Performance @ 10.3

US Counties benchmark = 3,143 geofences with 166 vertices on average (9 min / 838 max)

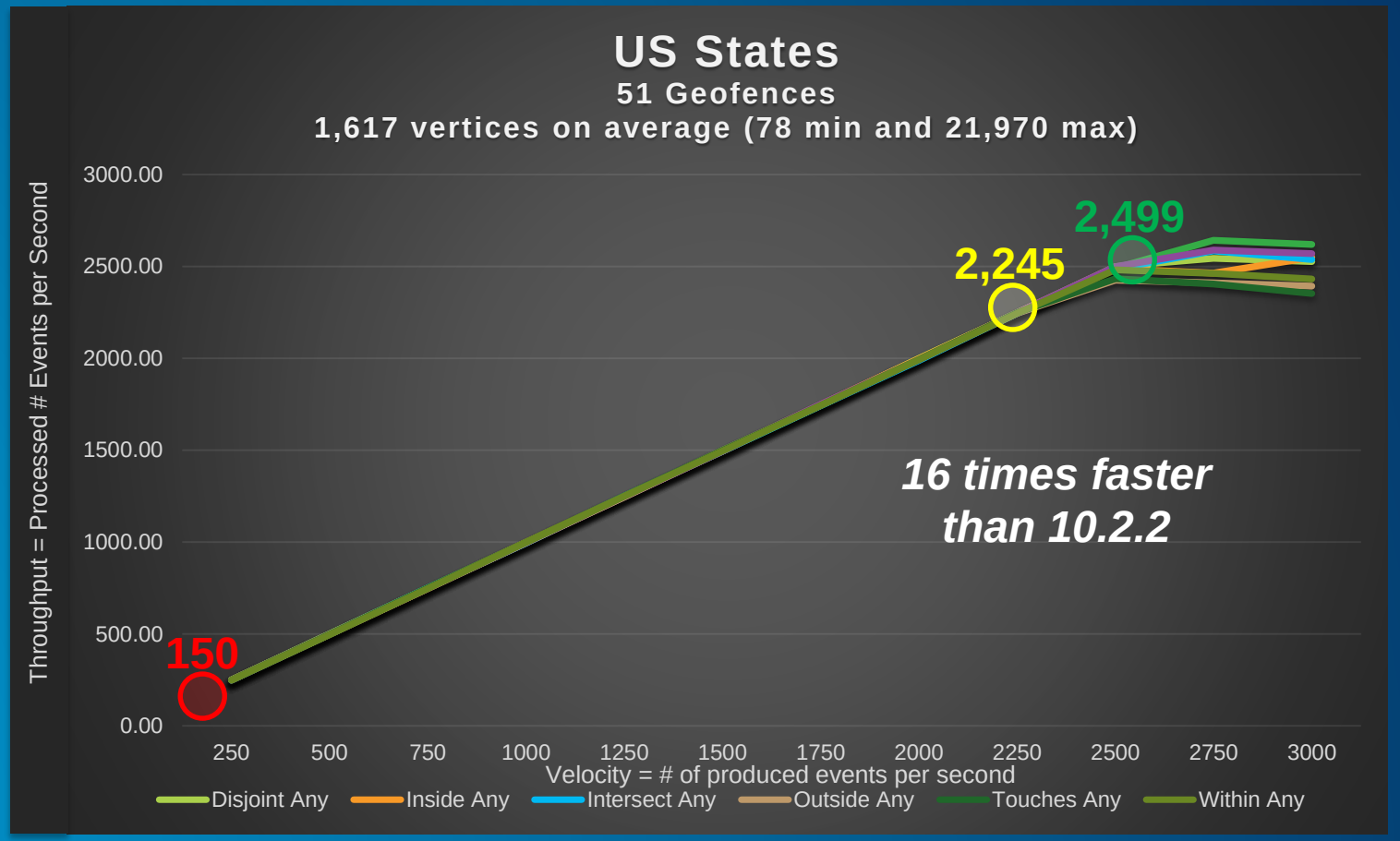


Geofencing Performance @ 10.3

US States benchmark



Operator	10.3 events per second	10.2.2 events per second
Disjoint Any	2,499	
Inside Any	2,488	150
Intersect Any	2,486	
Within Any	2,482	
Touches Any	2,248	
Outside Any	2,245	

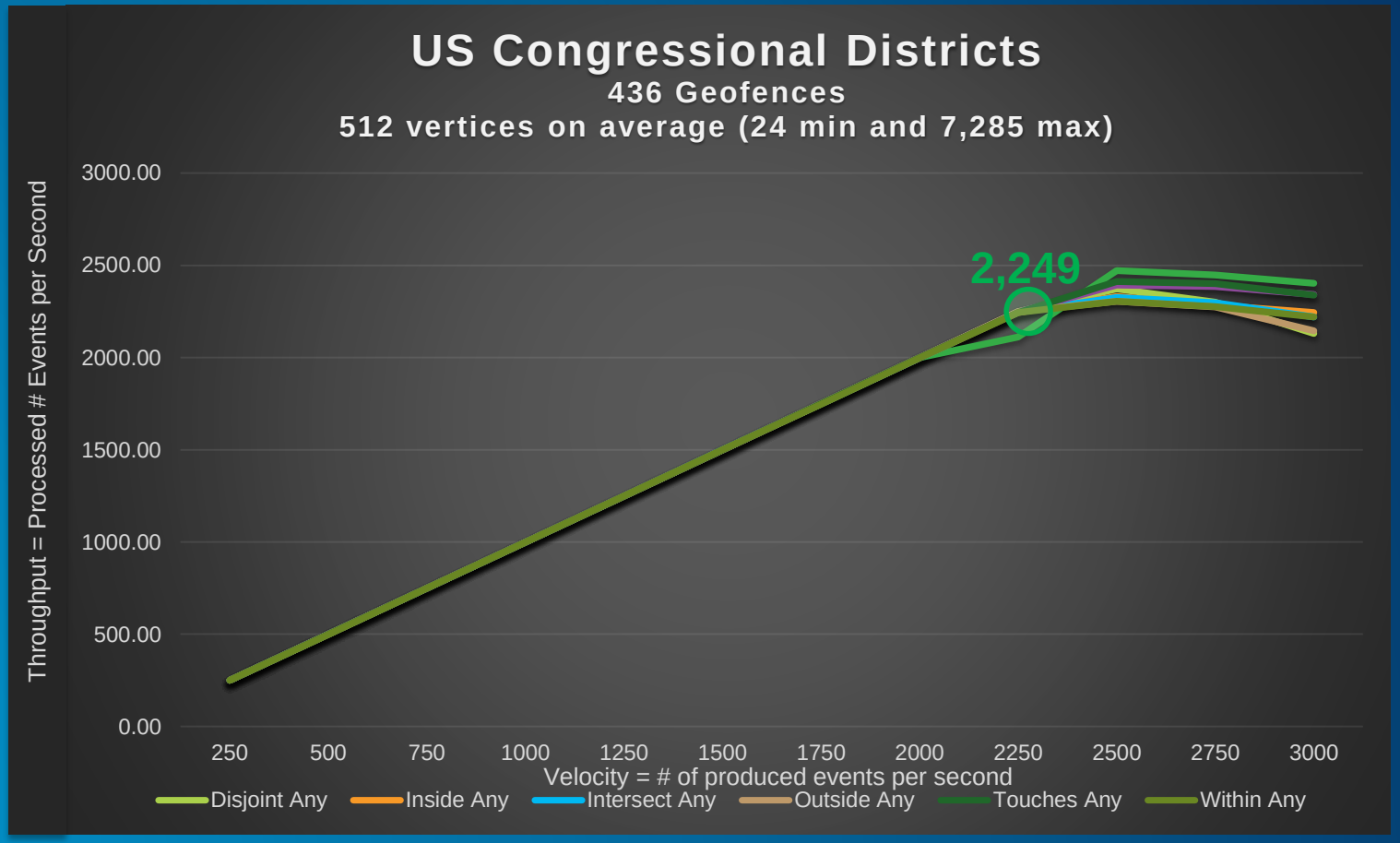


As captured on primary benchmarking machine using ArcGIS 10.3

Geofencing Performance @ 10.3

US Congressional Districts benchmark

Operator	10.3 events per second
Disjoint Any	2,249
Outside Any	2,248
Intersect Any	2,248
Touches Any	2,244
Within Any	2,244
Inside Any	2,244

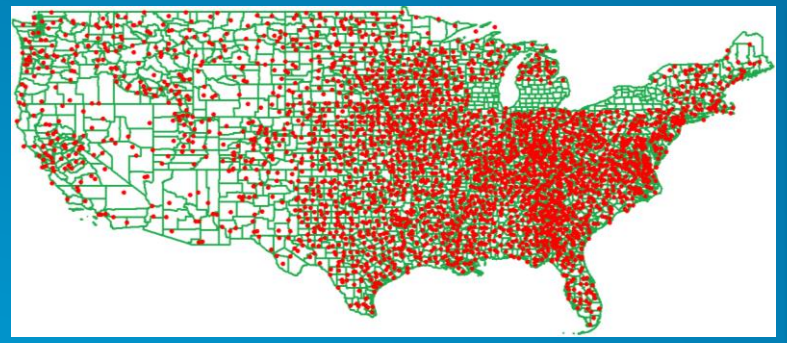


As captured on primary benchmarking machine using ArcGIS 10.3

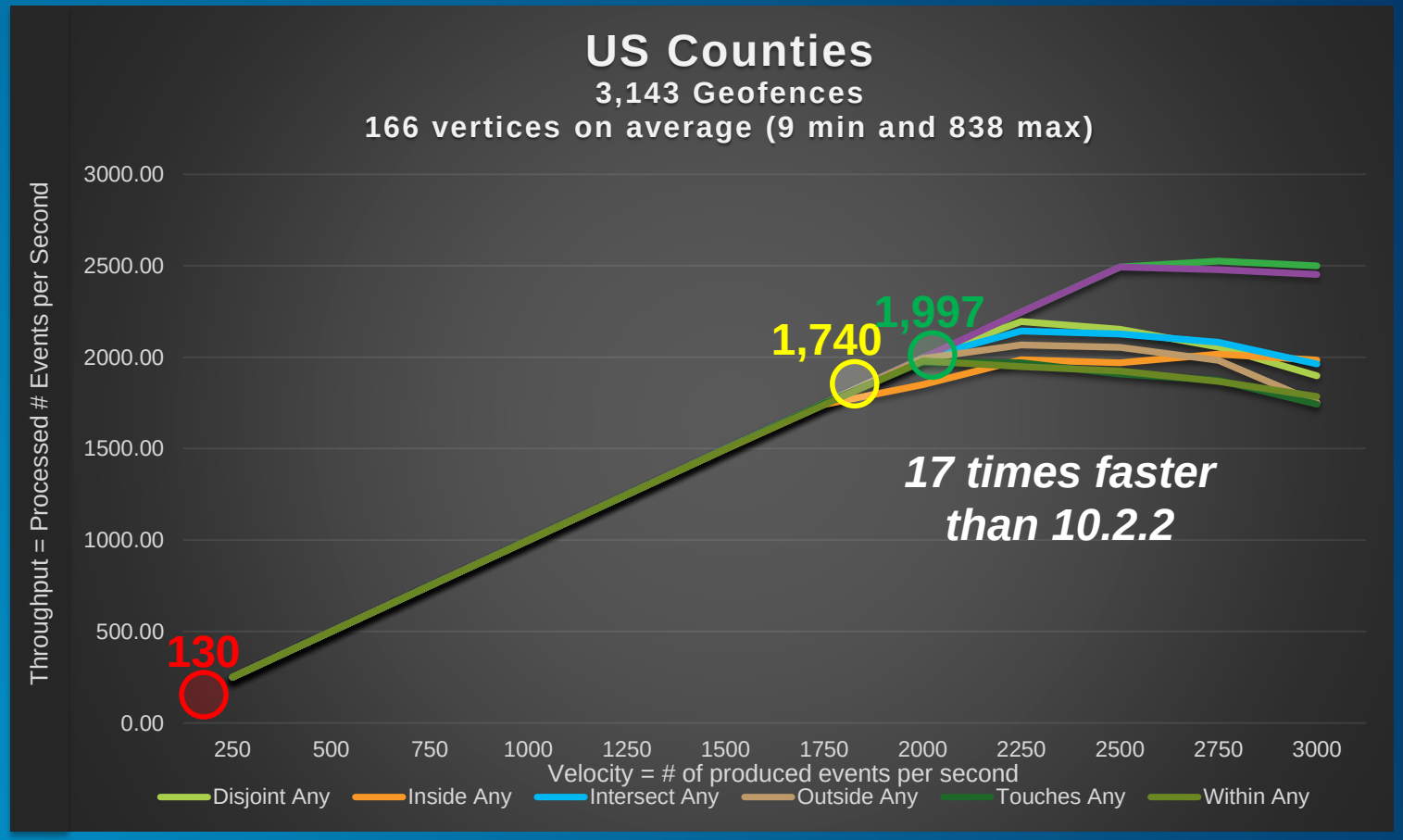
note: this scenario was not benchmarked at 10.2.2

Geofencing Performance @ 10.3

US Counties benchmark



Operator	10.3 events per second	10.2.2 events per second
Disjoint Any	1,997	
Intersect Any	1,996	
Outside Any	1,992	
Touches Any	1,747	
Inside Any	1,742	130
Within Any	1,740	



As captured on primary benchmarking machine using ArcGIS 10.3

Performance

Primary factors to consider

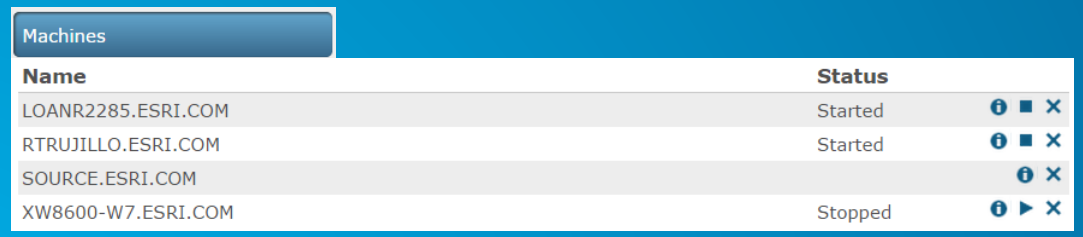
- **Operating environment**
  - **Virtual Machines – beware! resources need to be shared in an effective way, like EC2.**
  - **Bare-Metal machines – have dedicated resources which are much more deterministic.**
- **Network**
  - **Speed (Mbps) – the faster the better.**
- **RAM**
  - **size (GB) – minimum of 8GB is required at 10.3.**
  - **type (DDR2, DDR3) – minimum of DDR3 is recommended.**
  - **clock speed (MHz) – the faster the better.**
  - **transfer rate (Mbps) – the faster the better.**
- **Processor**
  - **speed (GHz) – the faster the better.**
  - **# of cores – the more the better.**

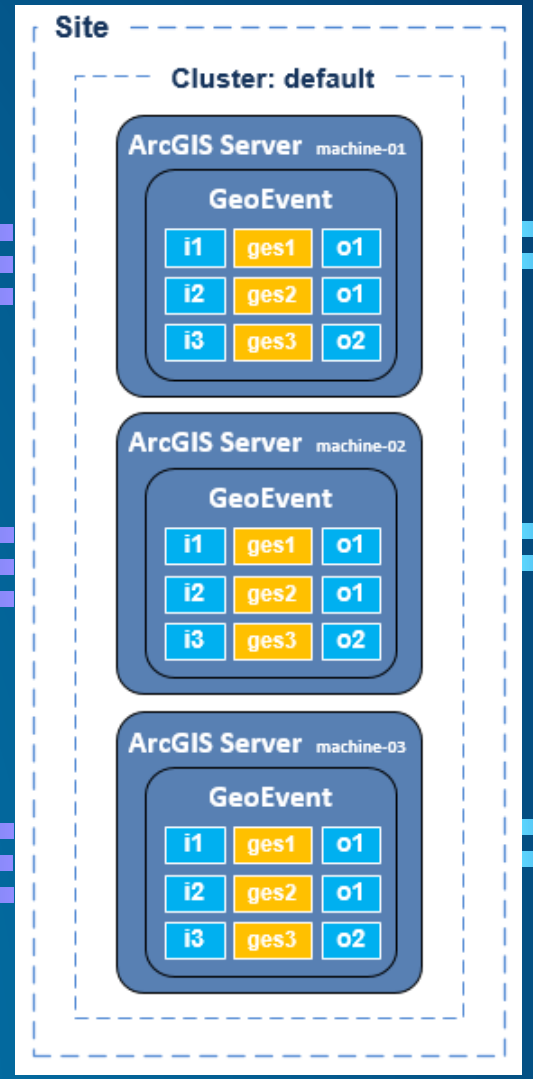
GeoEvent Extension
High Availability & Scalability

High Availability & Scalability

Clustering

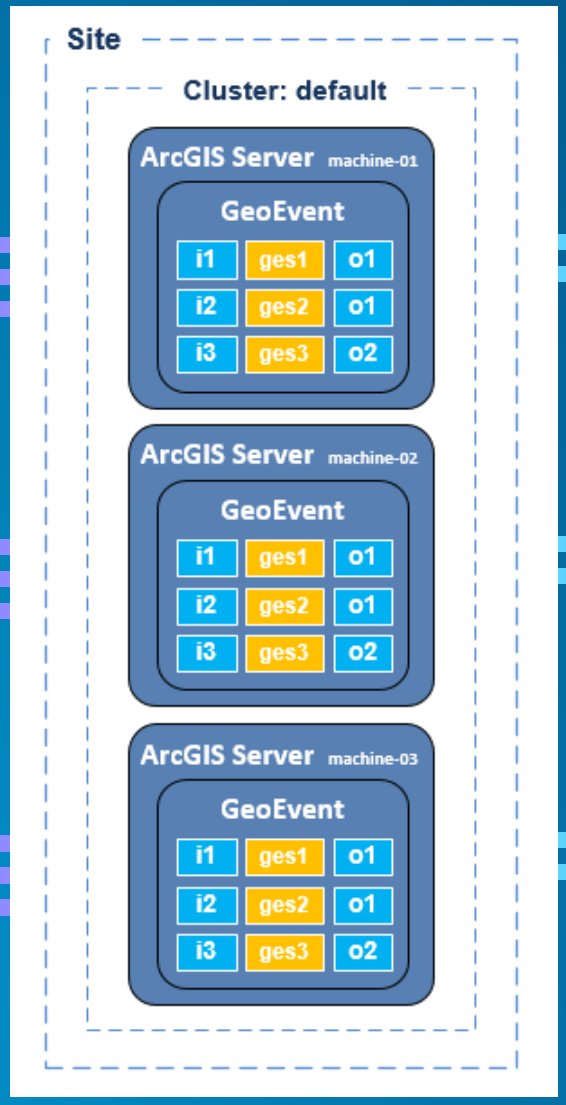
- Clusters administered via ArcGIS Server Manager
  - Site, Cluster(s), Machines
- Machines in a cluster share configuration
  - automatic provisioning upon joining a cluster
  - including custom components
- High Availability is achievable out-of-the-box
- Scale-out by adding machines to a cluster





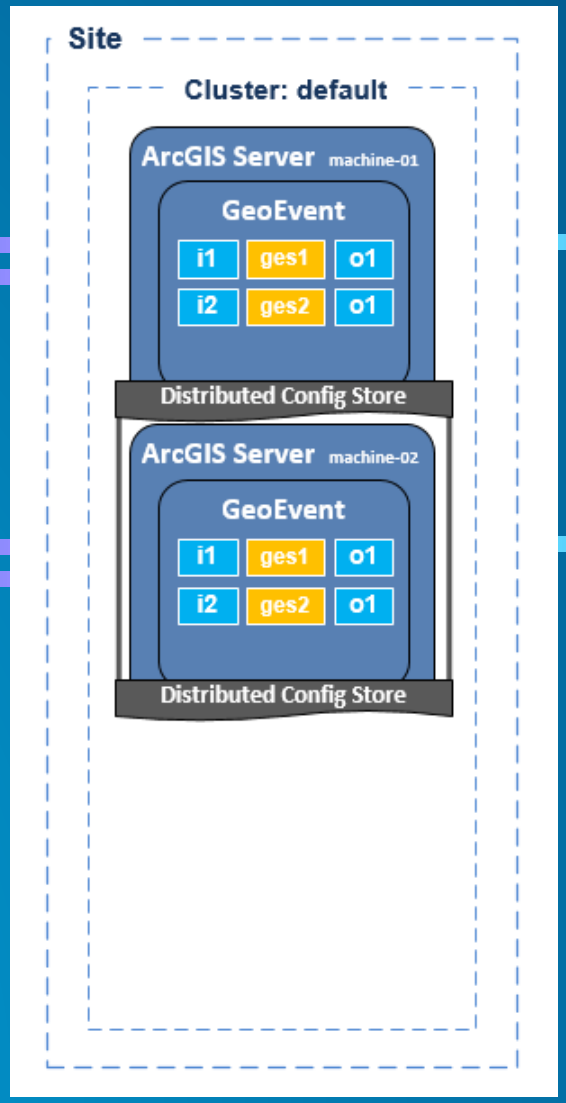
High Availability

Site(s), cluster(s), and machines



High Availability

Distributed configuration store



High Availability

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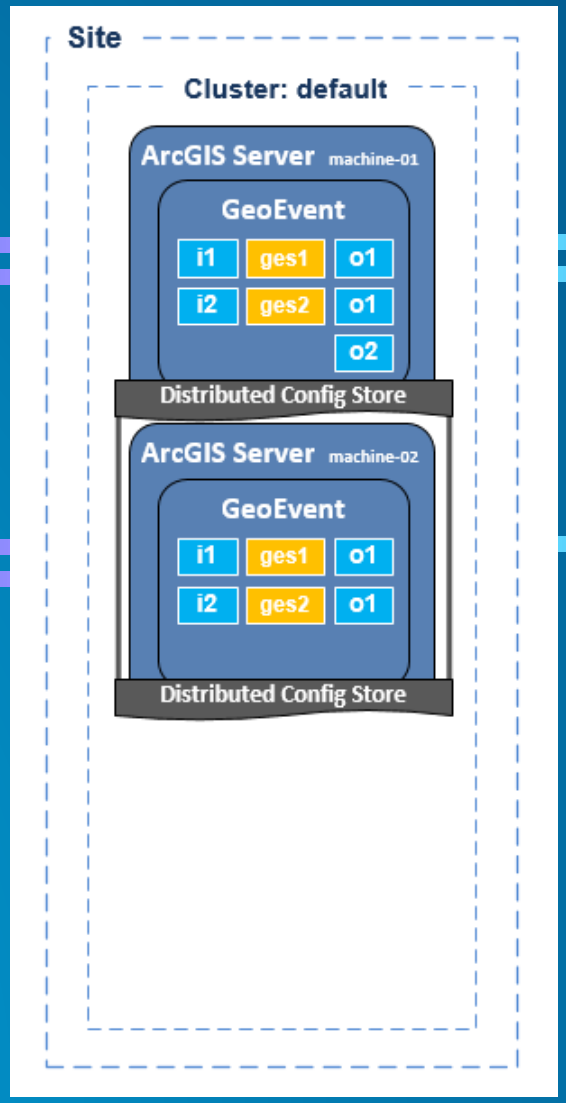

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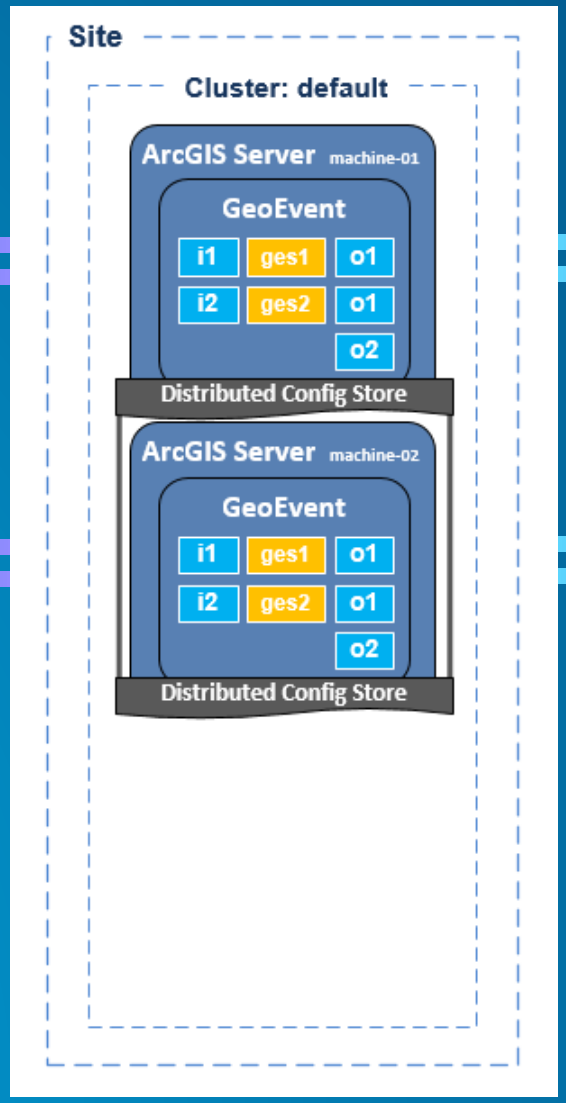

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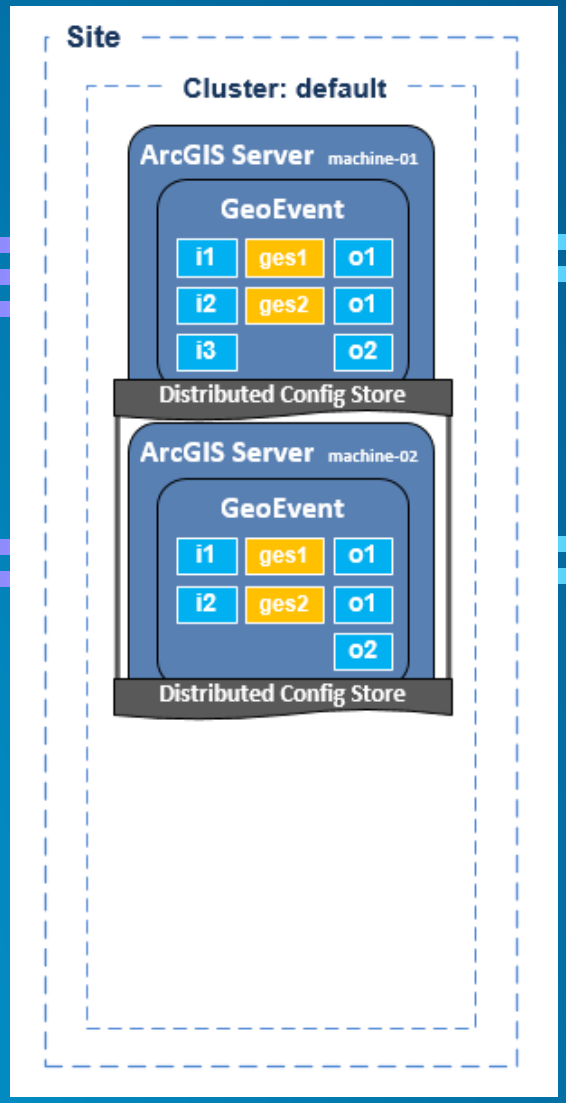

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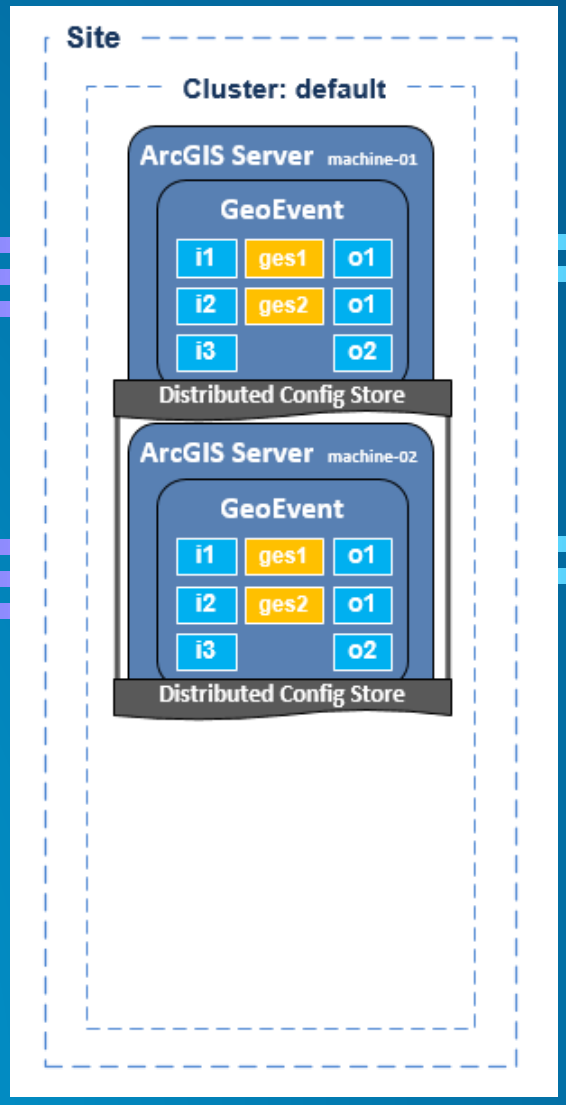

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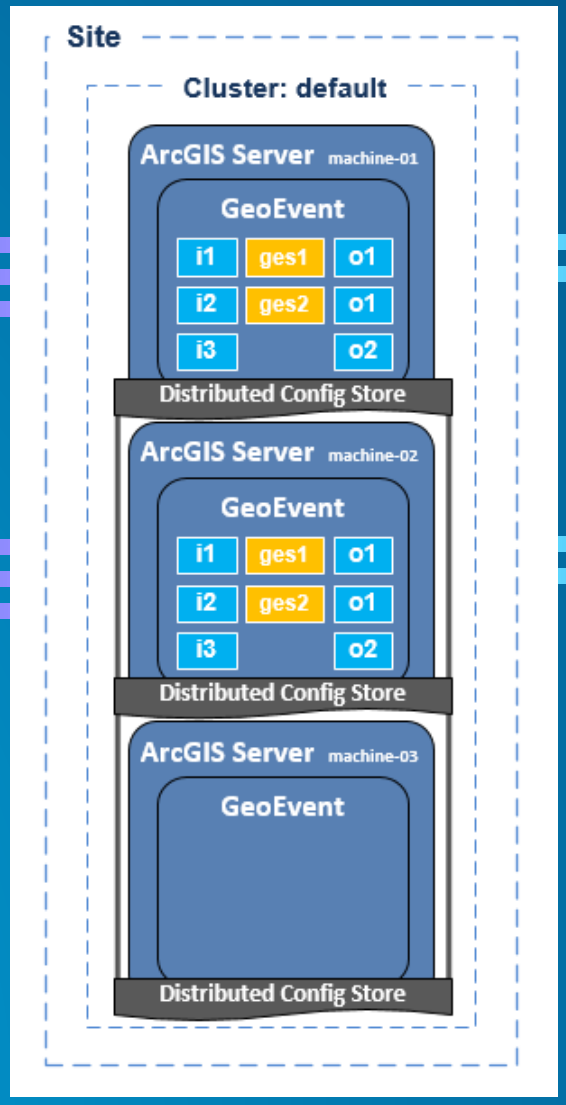
Distributed configuration store



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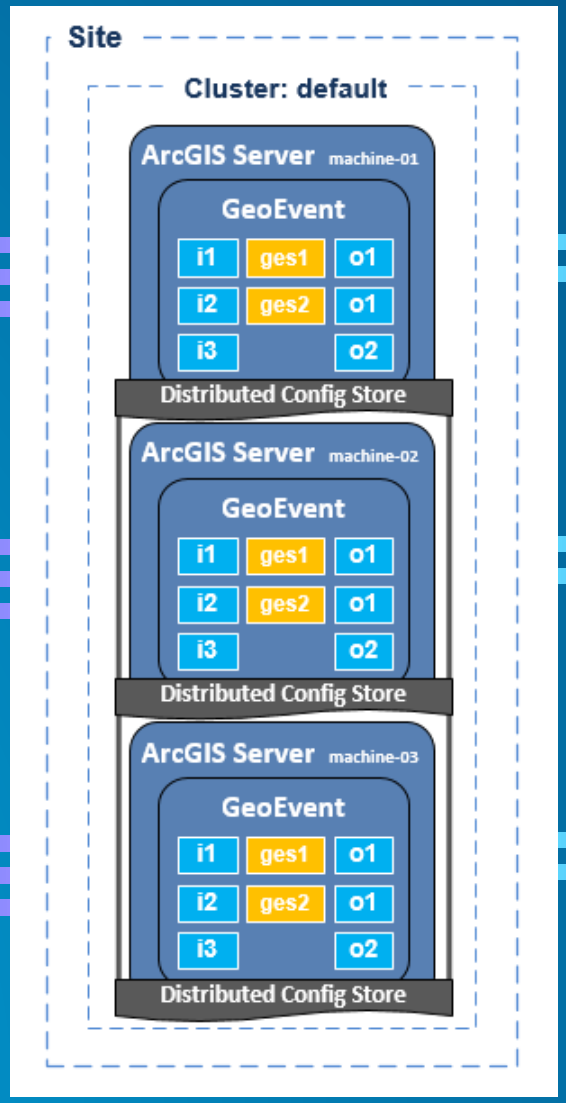

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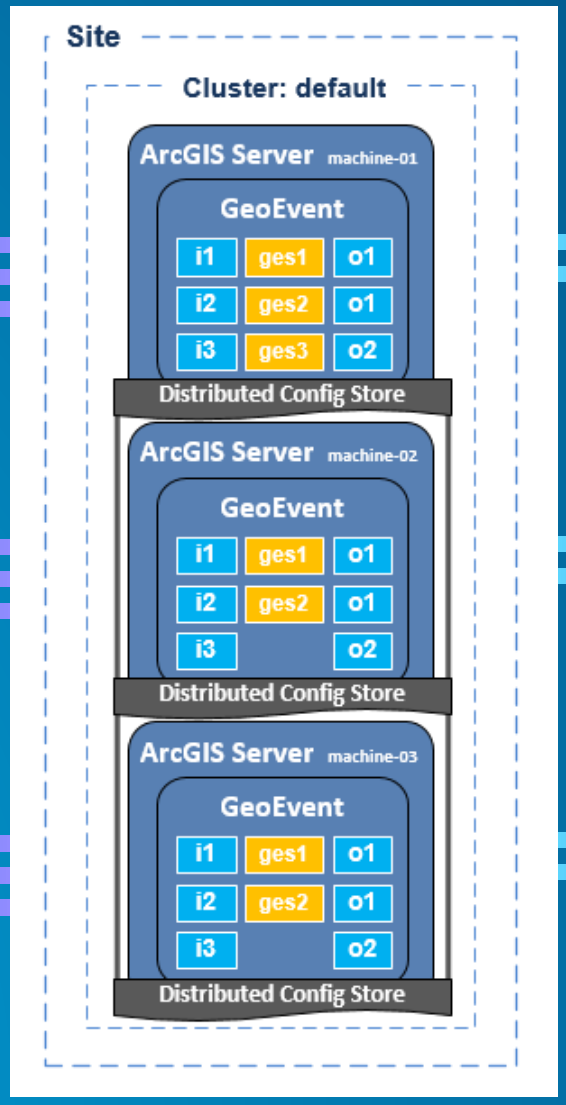

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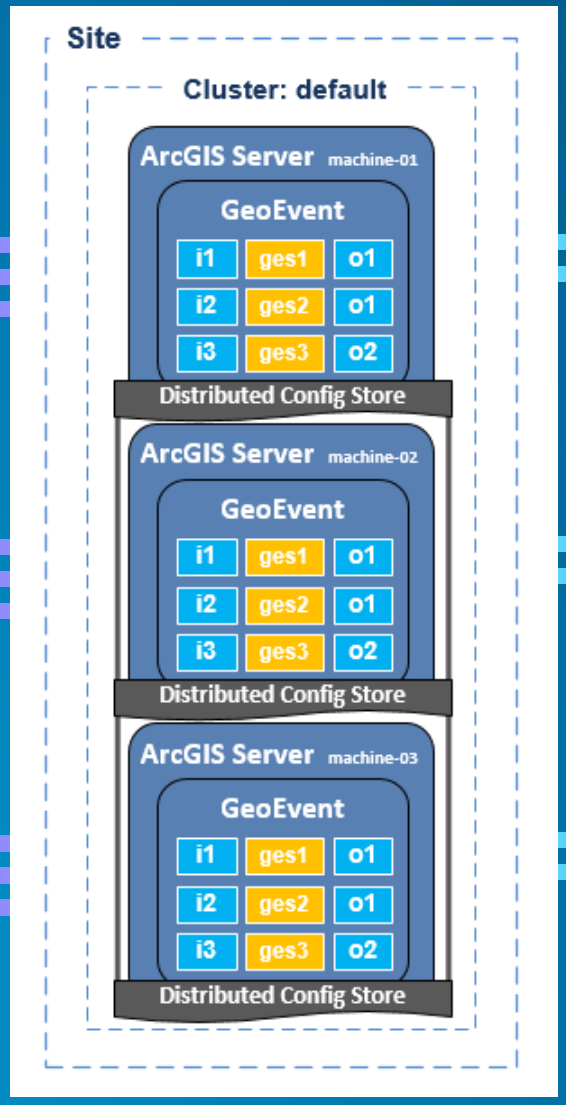
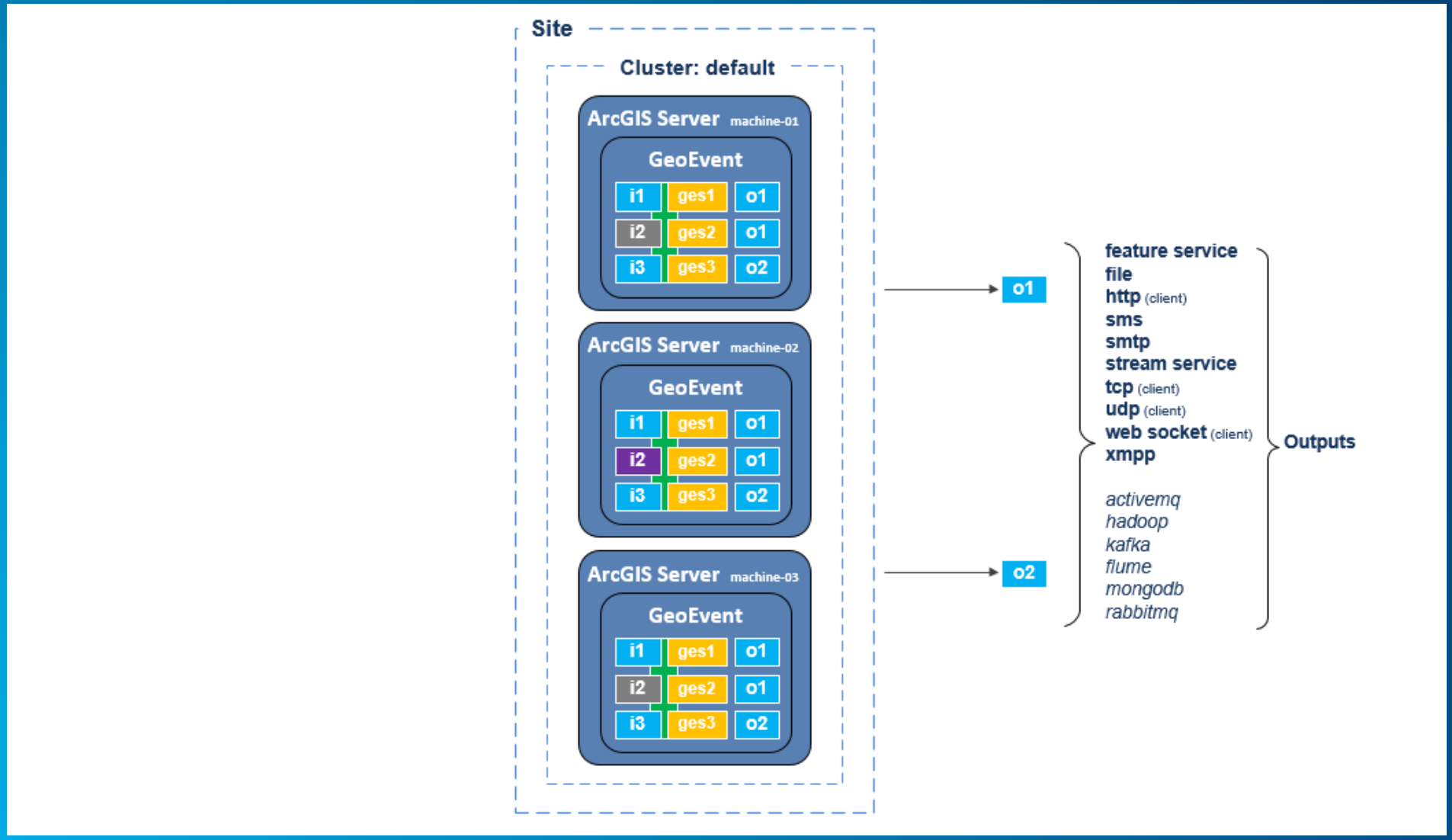


Scalability

Output transports



Scalability

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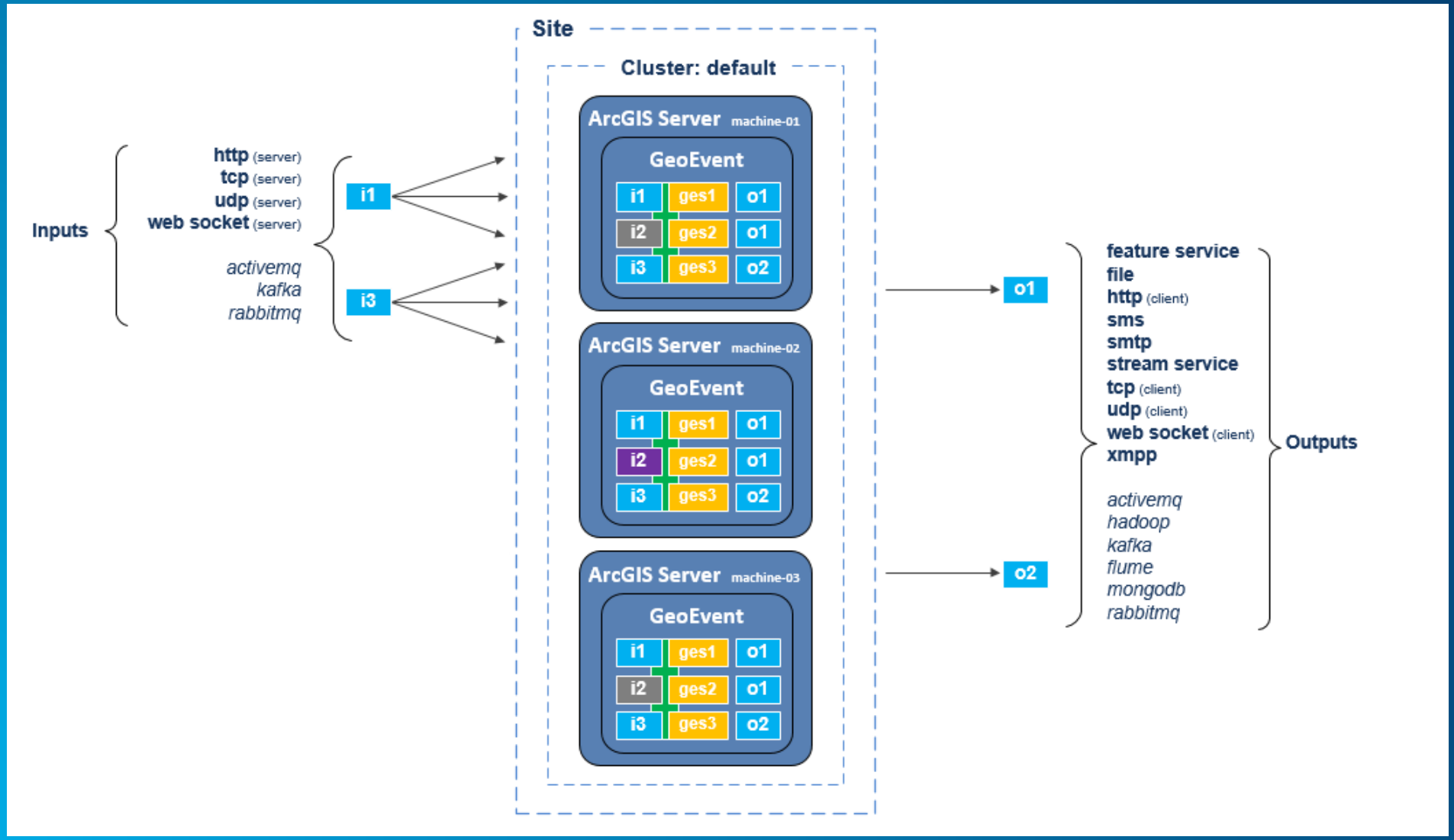
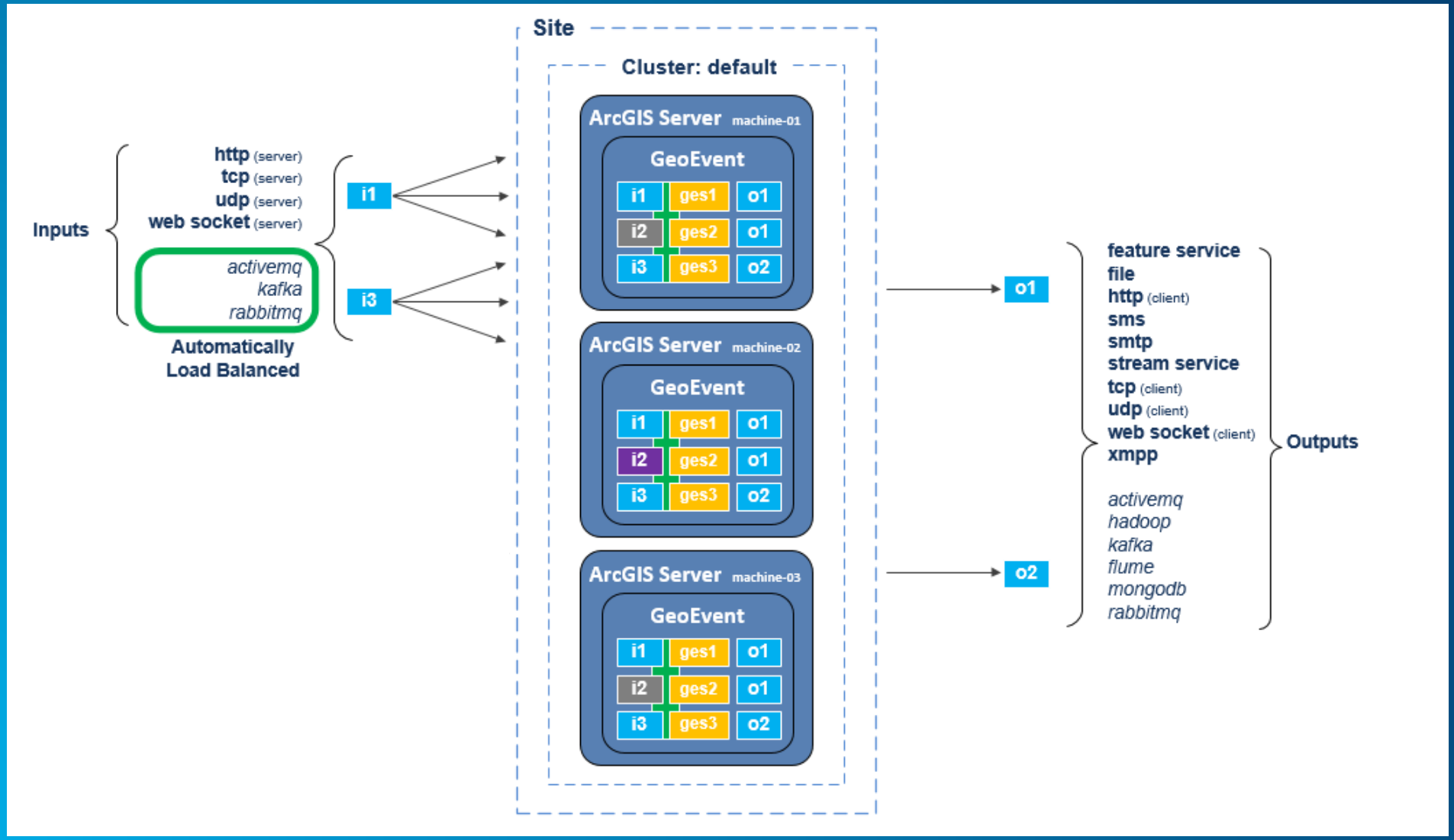


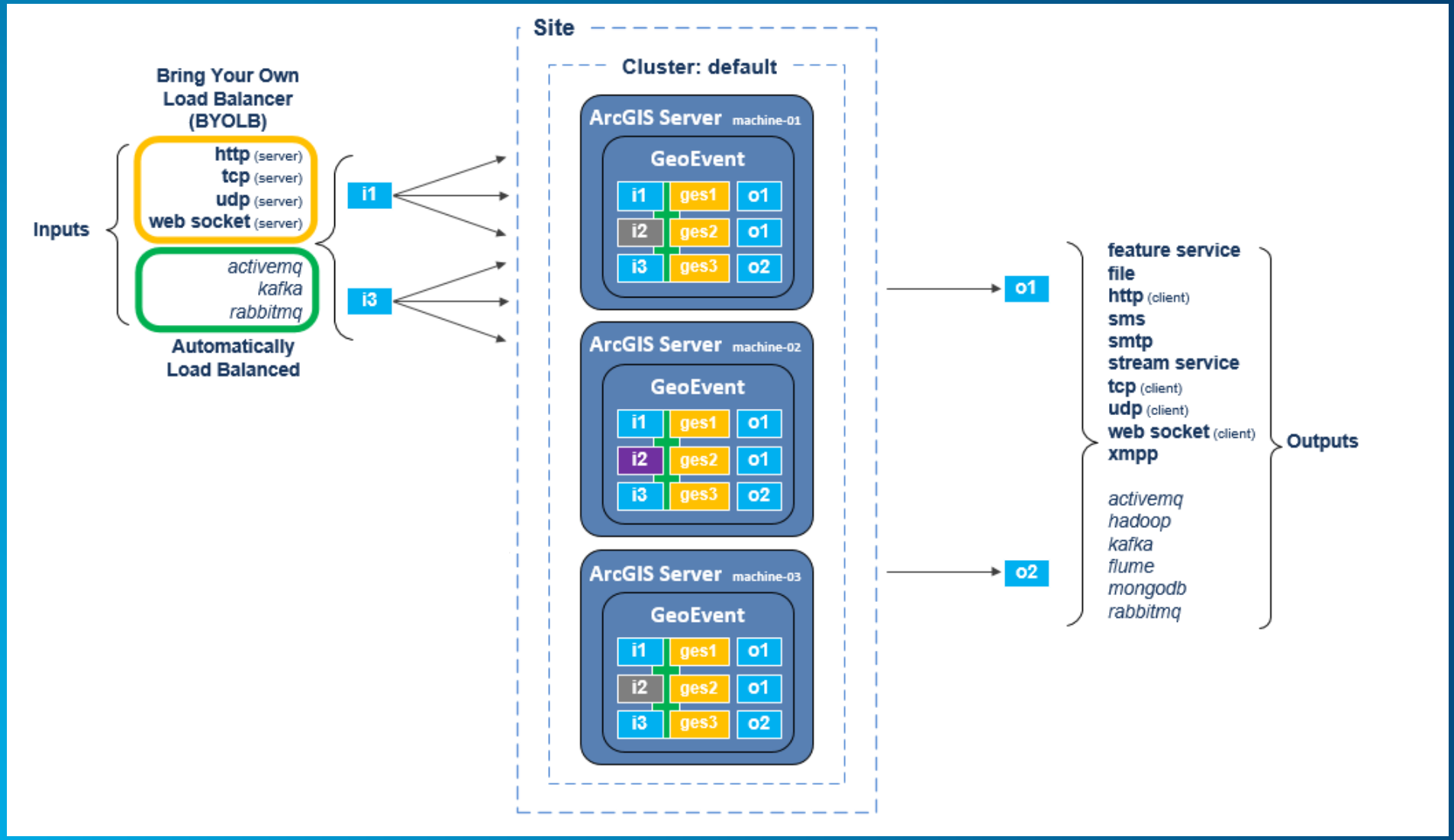
Scalability

Input transports that are automatically load balanced



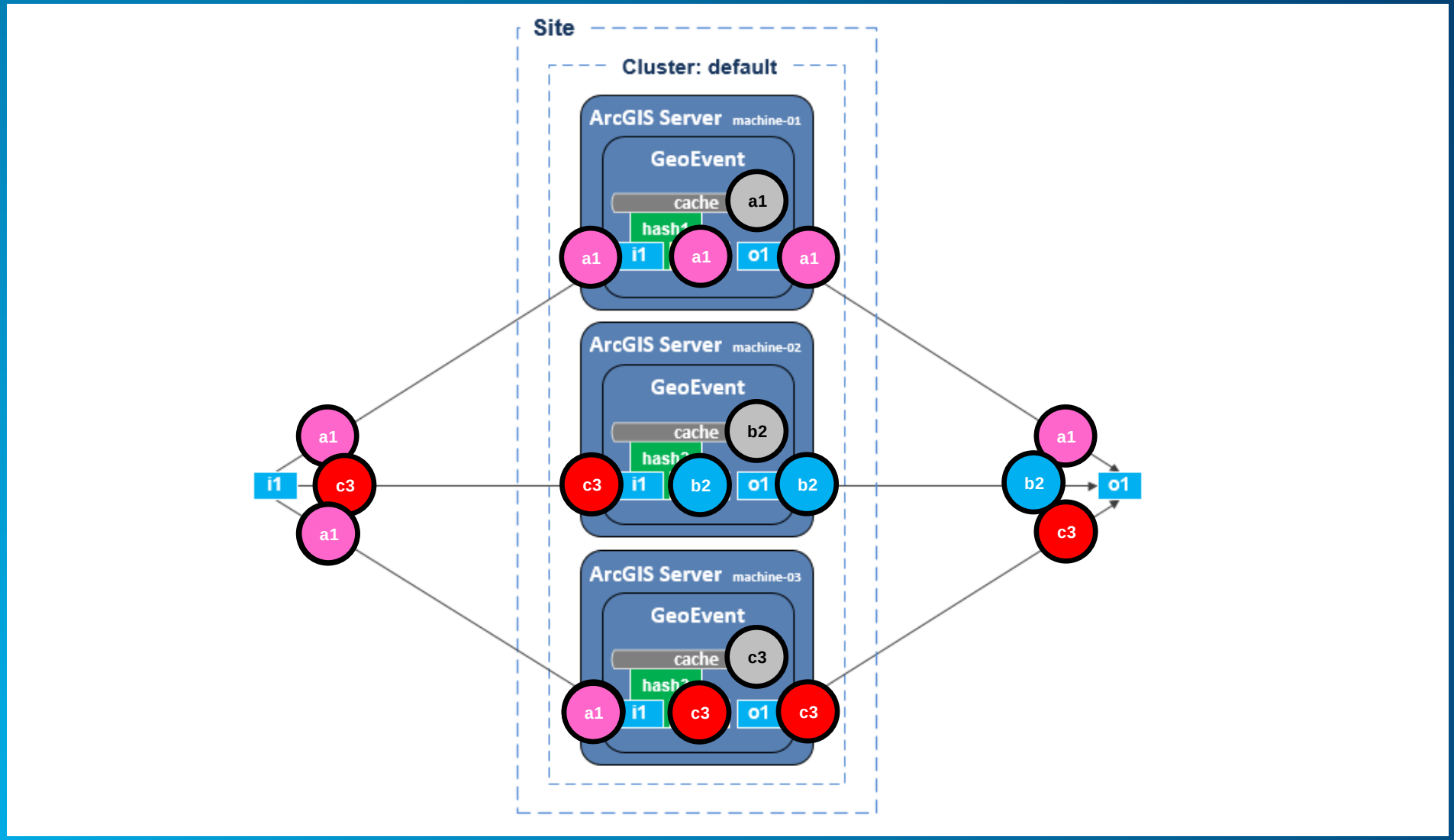
Scalability

Inputs transports that require you to bring your own load balancer



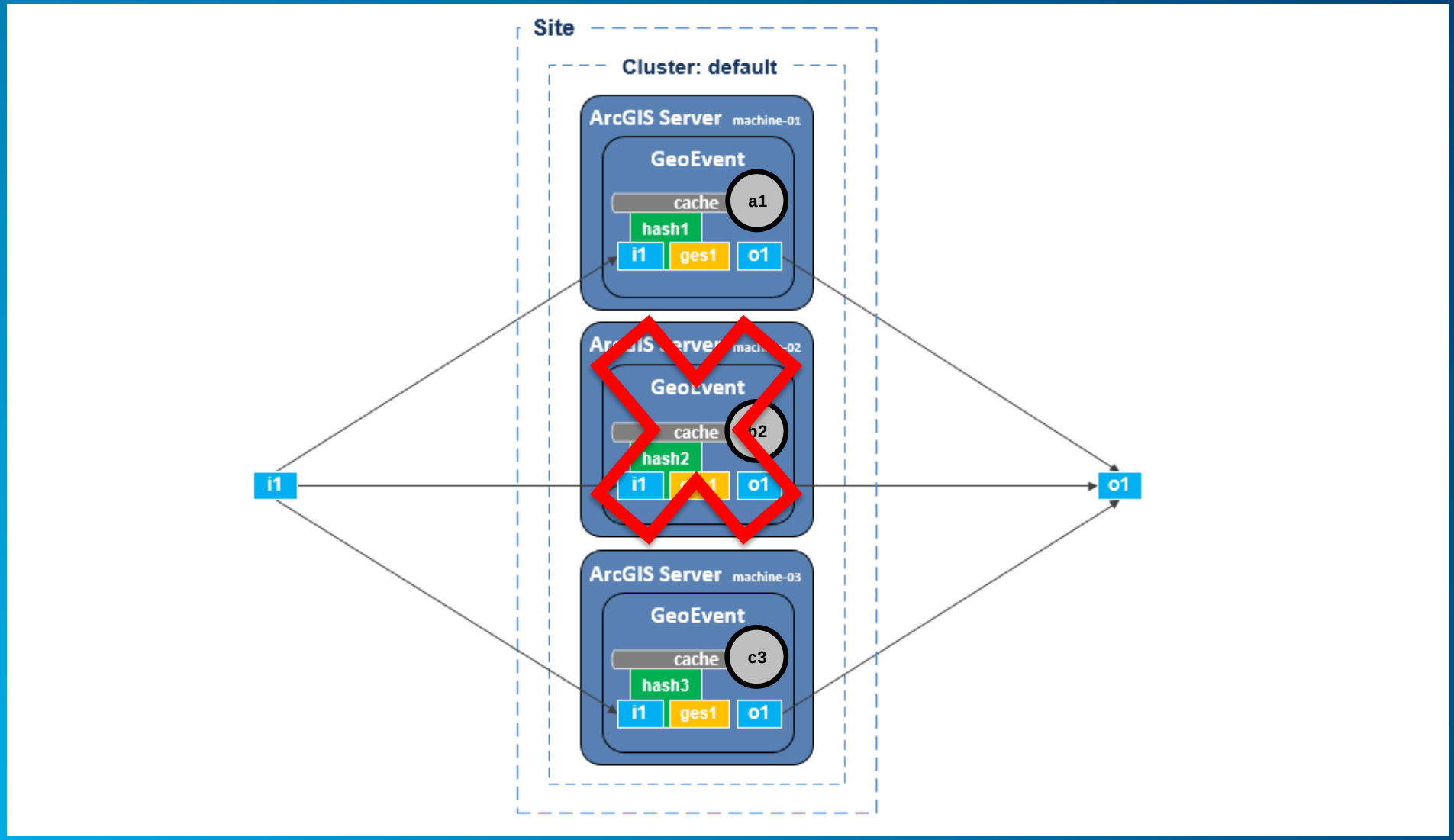
Scalability

Inputs and distributed stream processing



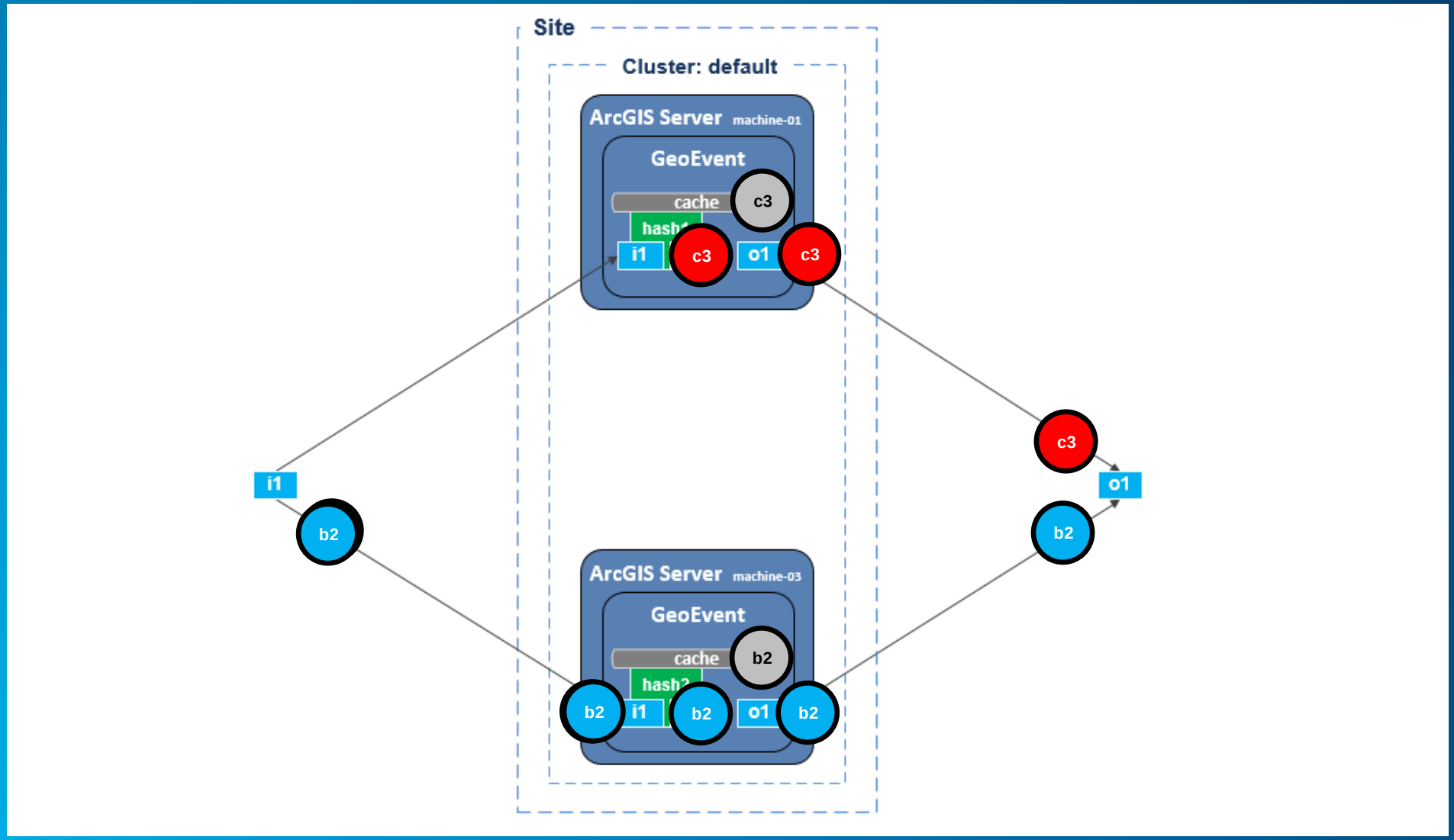
High Availability

Inputs and distributed stream processing



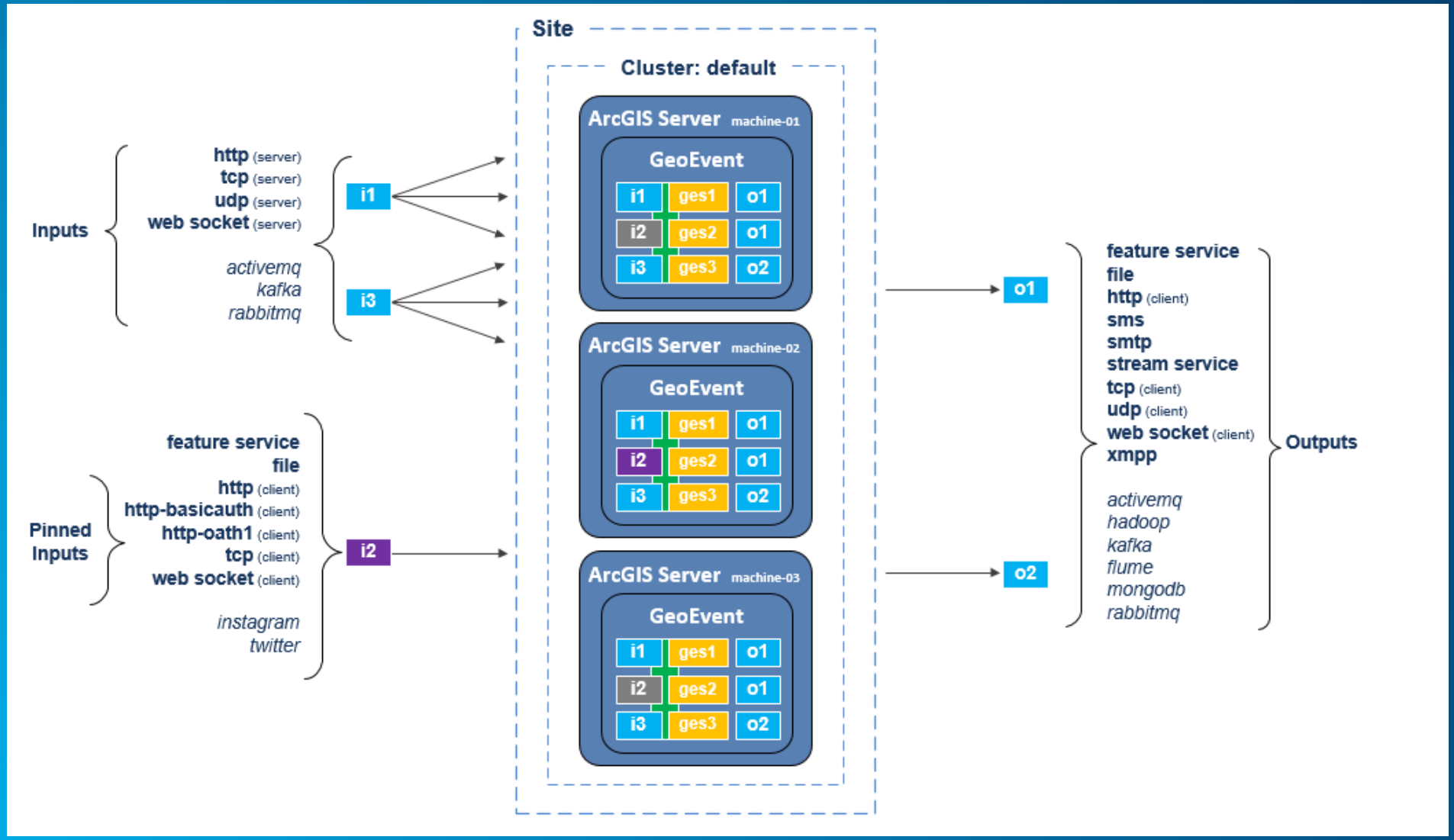
High Availability

Inputs and distributed stream processing



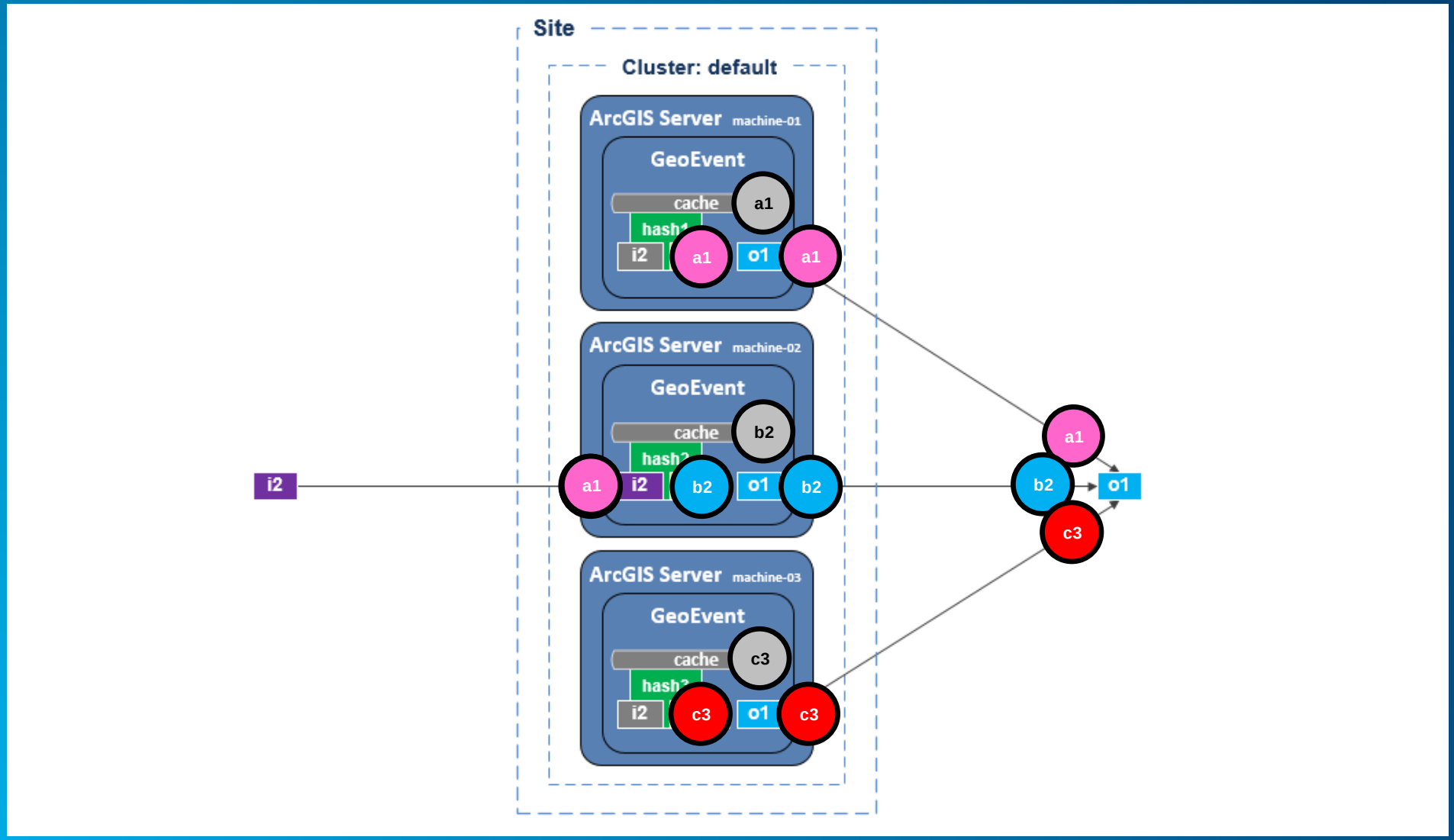
Scalability

Pinned inputs



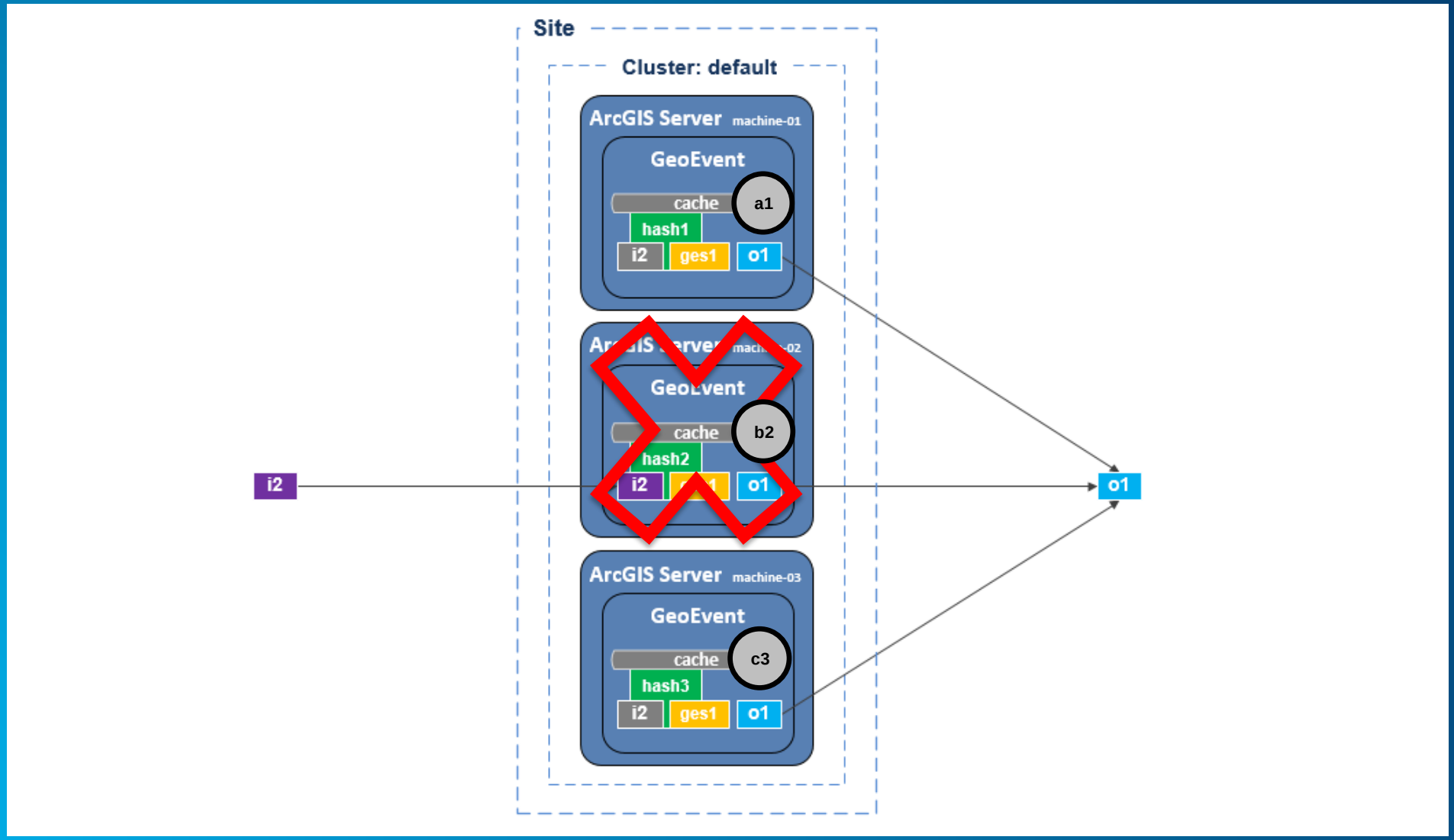
Scalability

Pinned inputs and distributed stream processing



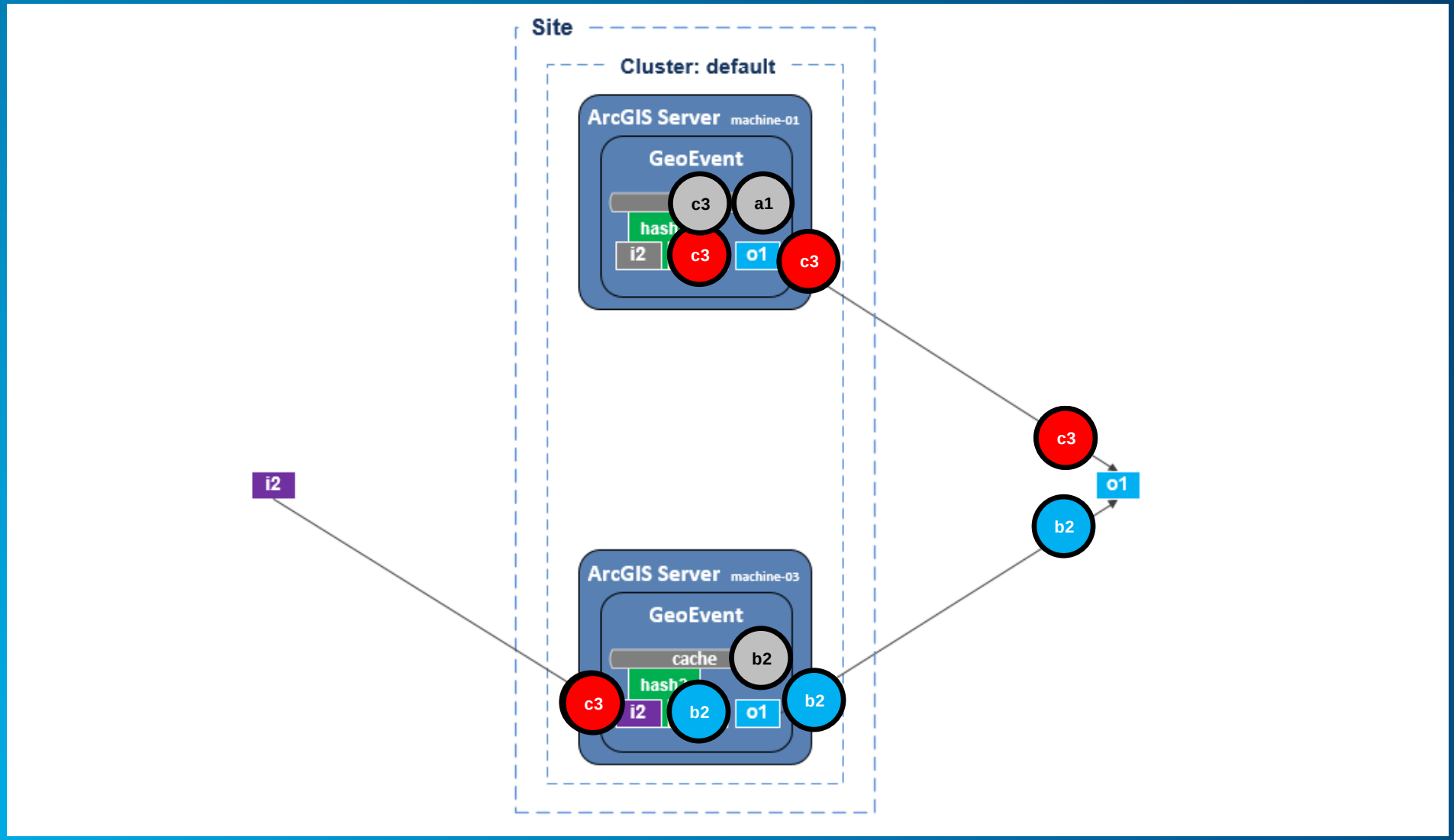
High Availability

Pinned inputs and distributed stream processing



High Availability

Pinned inputs and distributed stream processing



Scalability

Clustering for increased throughput

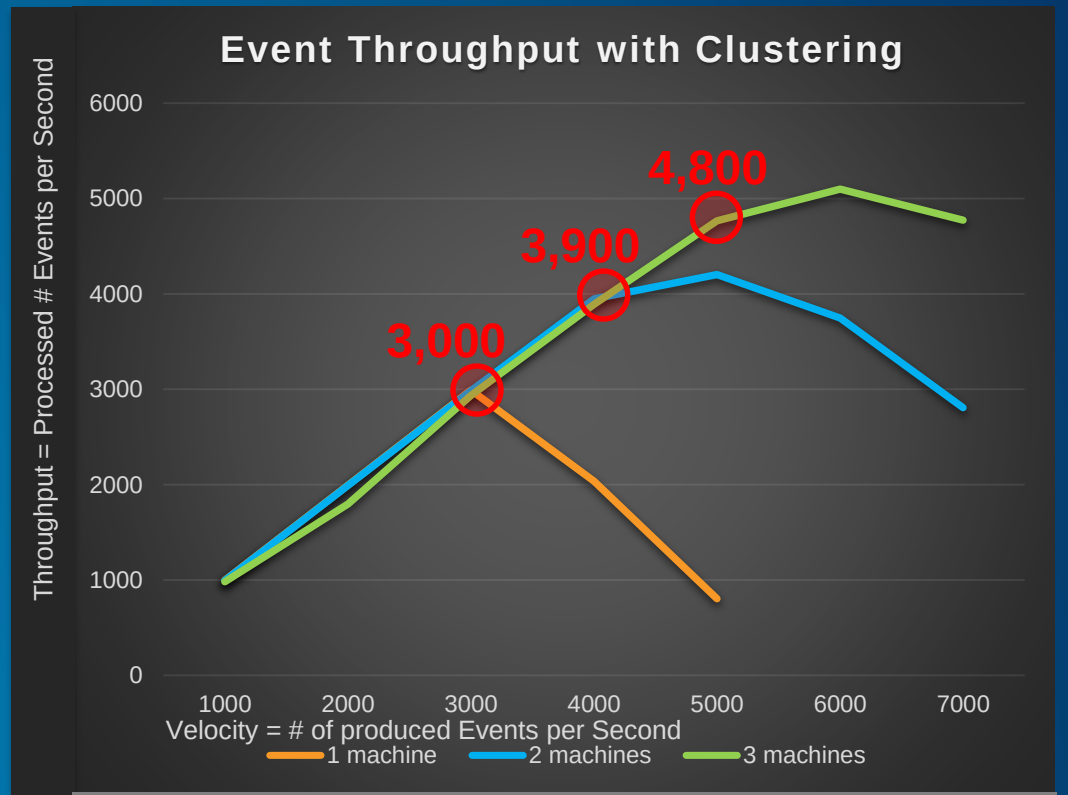
- **Clusters administered via ArcGIS Server Manager**
  - **Site, Cluster(s), Machines**
- **Scale-out by adding machines to a cluster**

Machines

Name	Status
LOANR2285.ESRI.COM	Started
RTRUJILLO.ESRI.COM	Started
SOURCE.ESRI.COM	
XW8600-W7.ESRI.COM	Stopped

Clusters

Name	Machines	Protocol
default	SOURCE.ESRI.COM LOANR2285.ESRI.COM RTRUJILLO.ESRI.COM	TCP port 4004



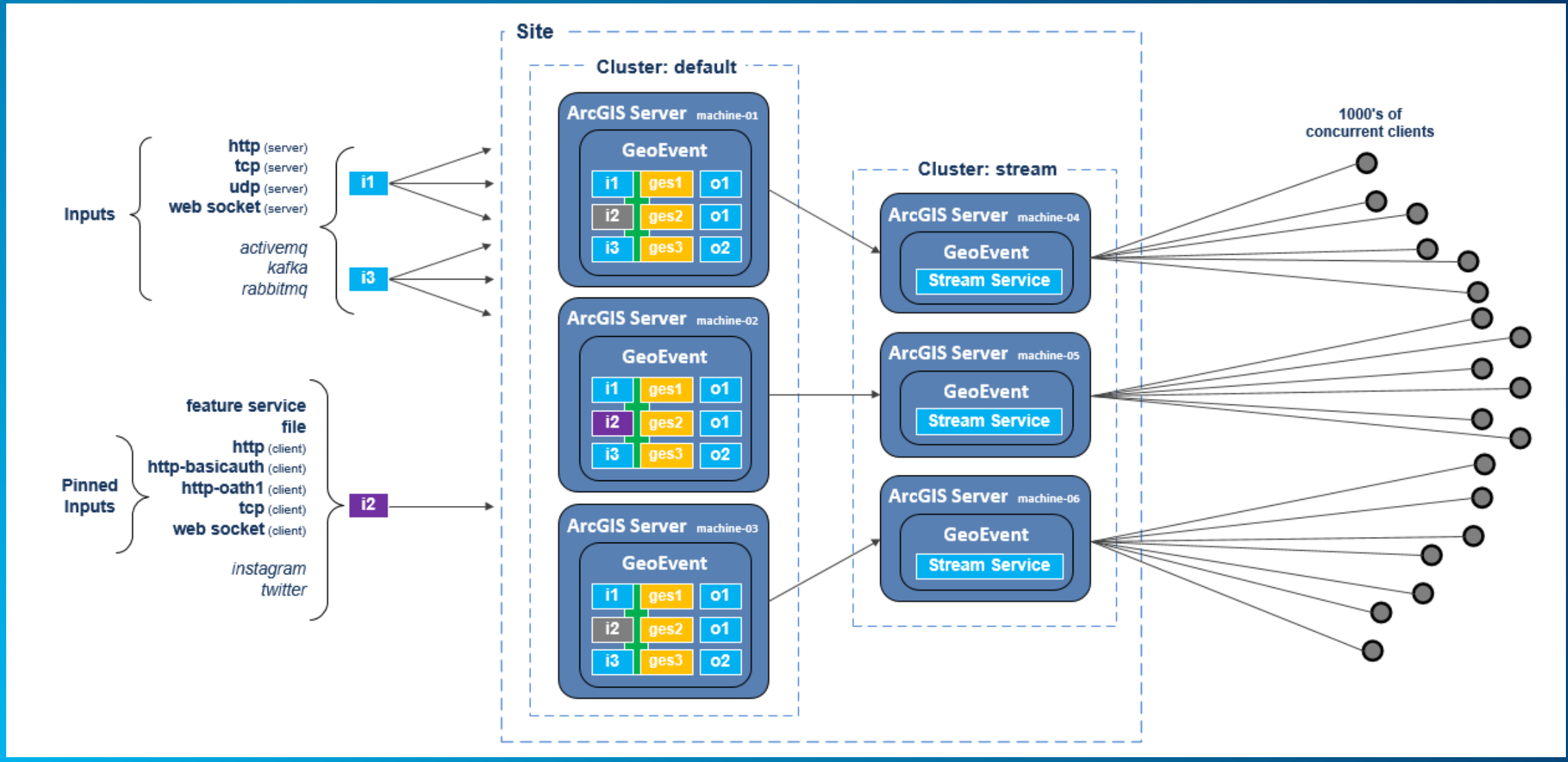
Machine	Mfg	OS	CPU Type	CPU	Cores	RAM	Role
loanr2285	Dell	W7-64 Ent	Intel Core I7	2.80GHz	8	16GB	geoevent-01
rtrujillo	Dell	W7-64 Ent	Intel Xeon	3.70GHz	8	16GB	geoevent-02
source	Dell	W8.1 Ent	Intel Core i7	2.80GHz	8	16GB	geoevent-03

As captured on 10.3 benchmarking cluster using ArcGIS 10.3

Stream Services
High Availability & Scalability

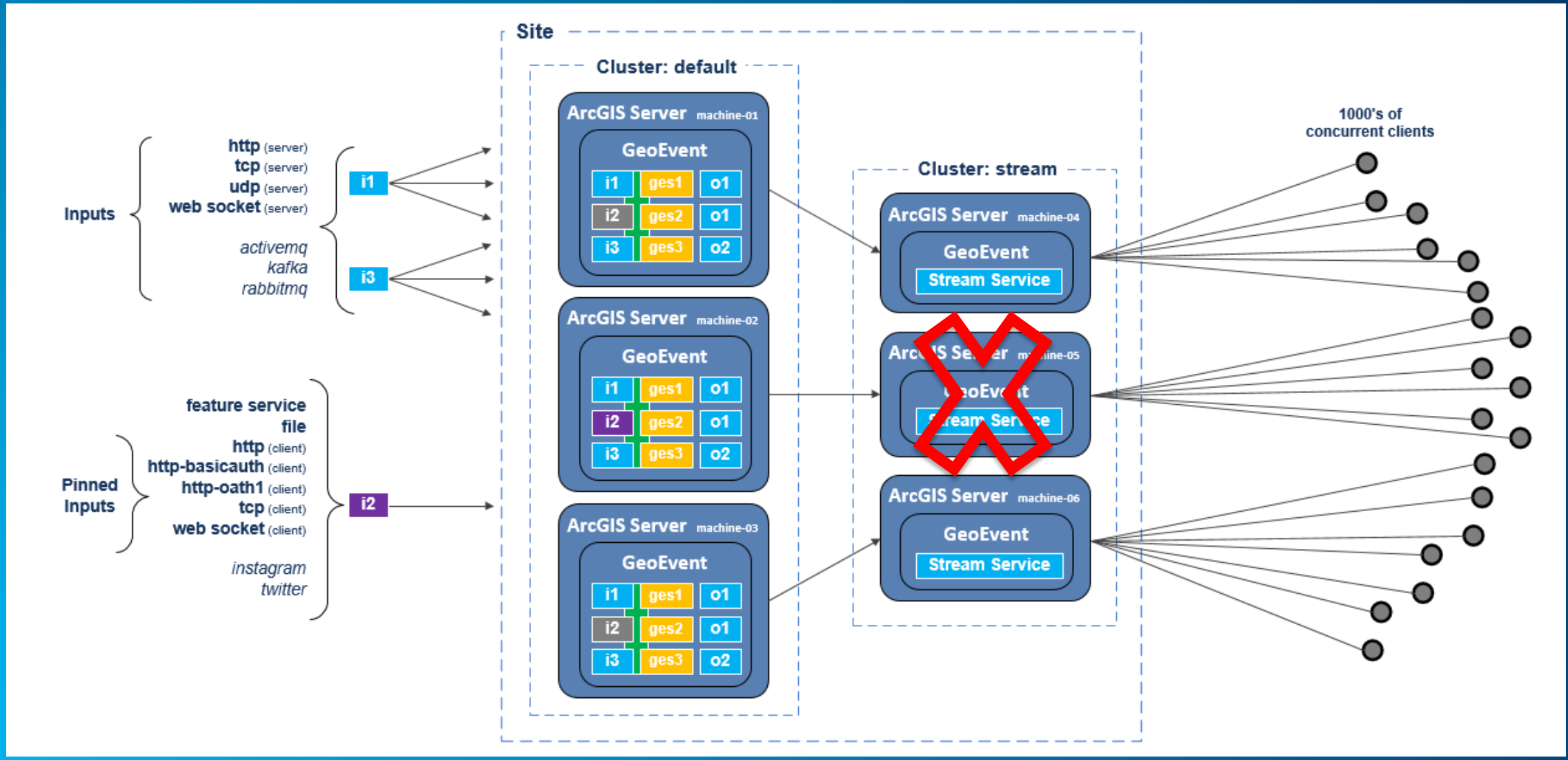
Scalability

Scaling out Stream Services to support an increased # of concurrent users



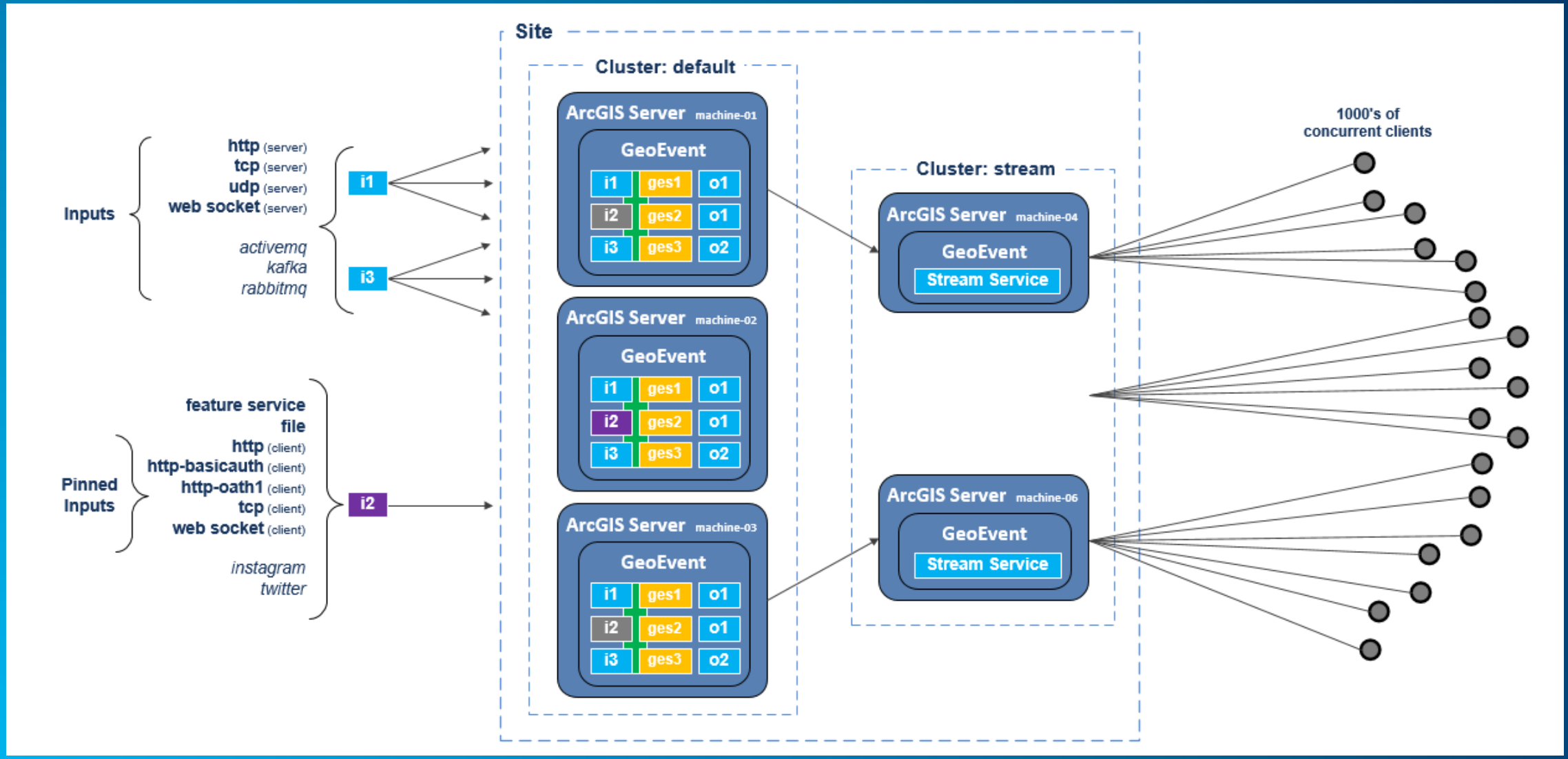
High Availability

Stream Services concurrent user failover



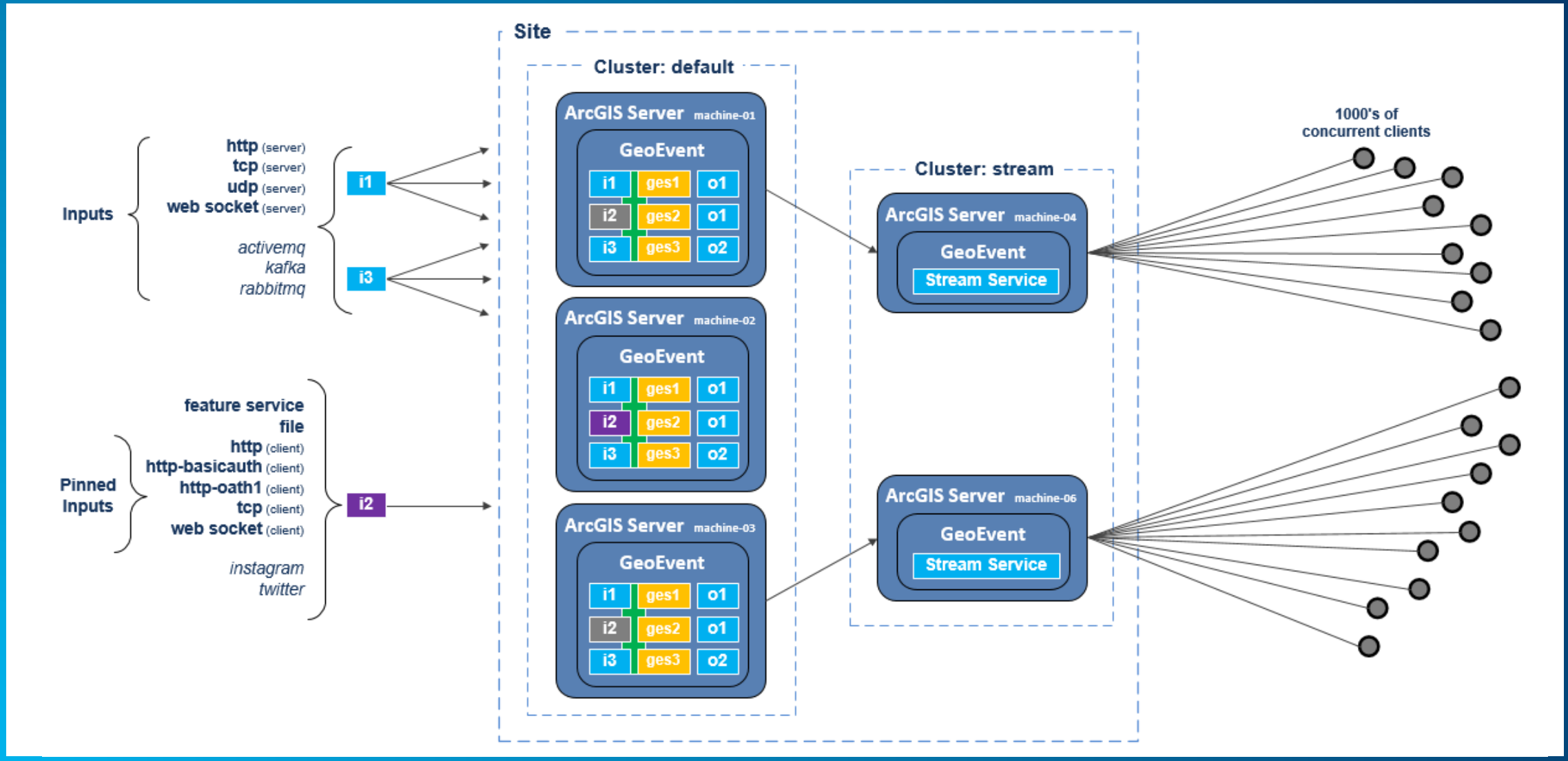
High Availability

Stream Services concurrent user failover



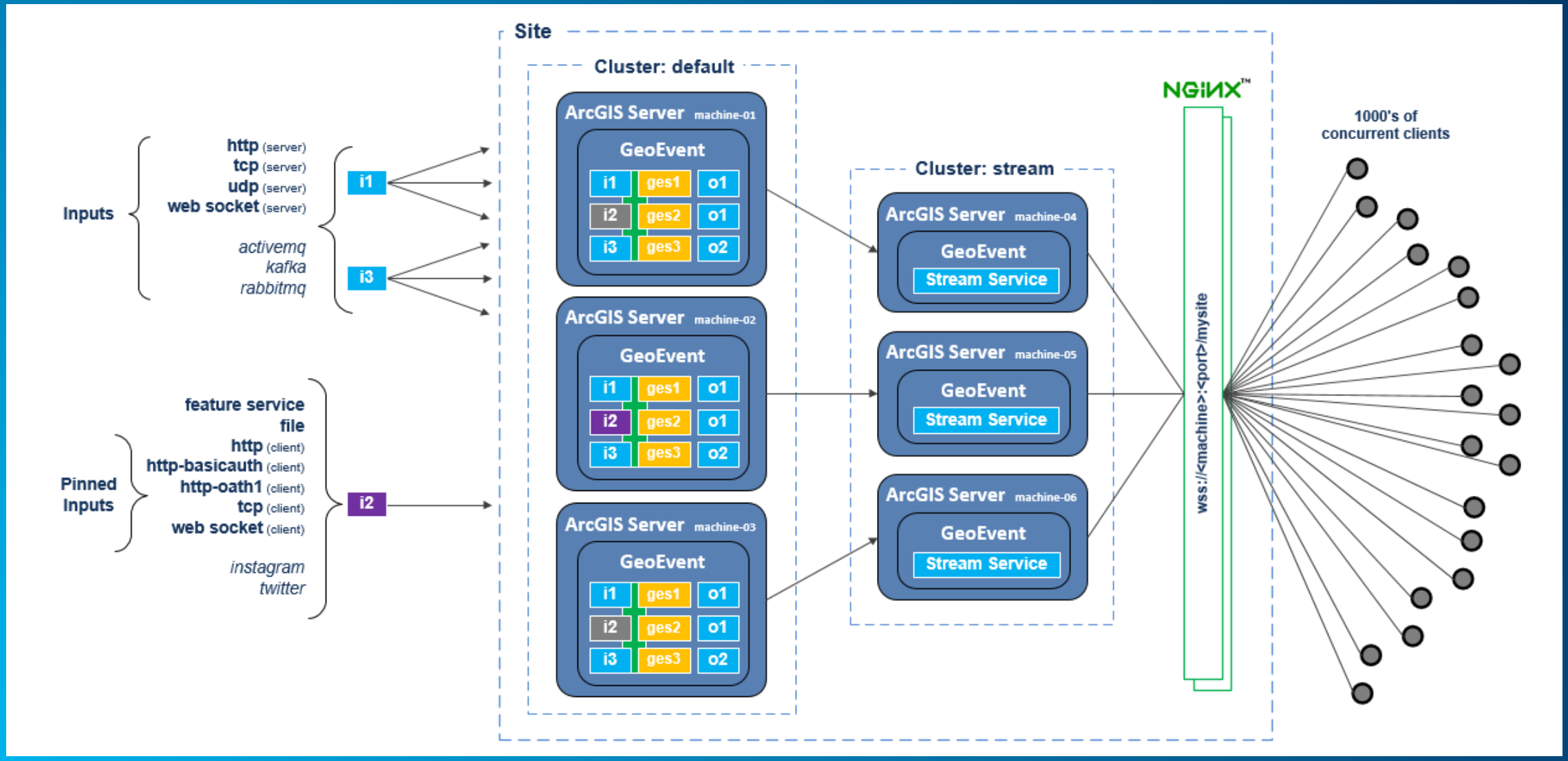
High Availability

Stream Services concurrent user failover



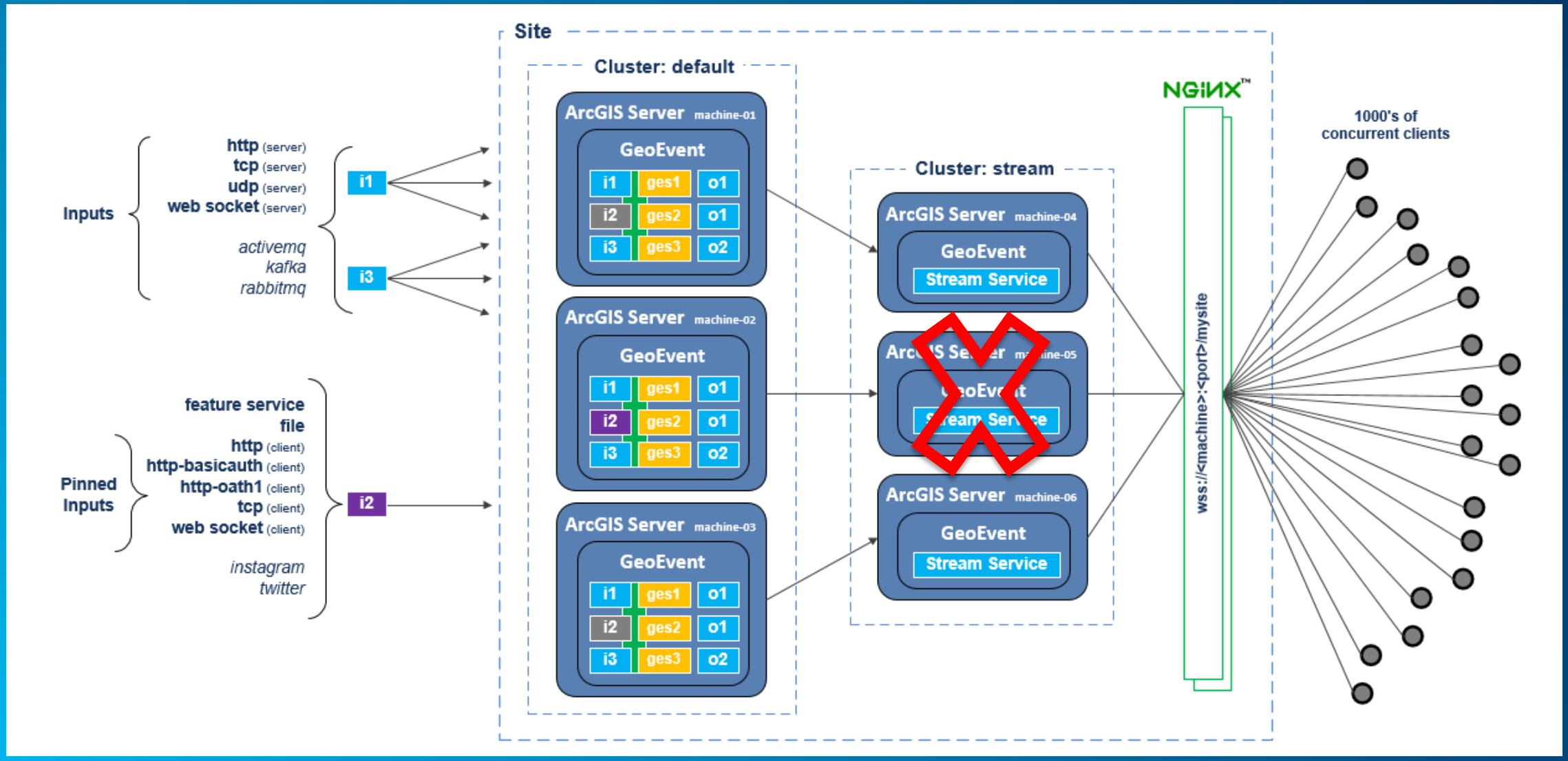
Scalability

Scaling out Stream Services to support an increased # of concurrent users with a reverse proxy



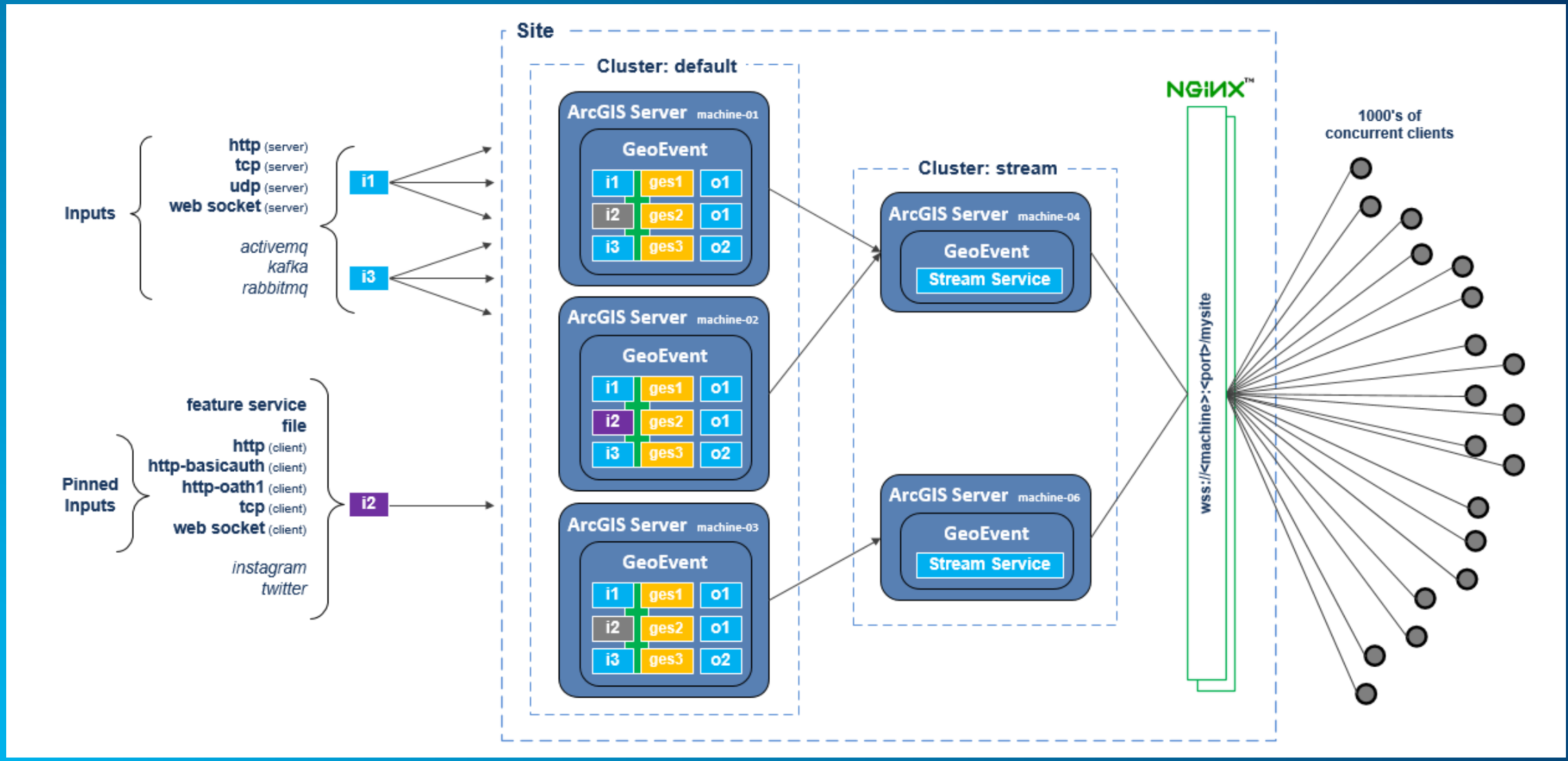
High Availability

Stream Services concurrent user failover with a reverse proxy



High Availability

Stream Services concurrent user failover with a reverse proxy



GeoEvent Extension: Best Practices

Summary

- **ArcGIS is a dynamic platform that enables continuous analytics and real-time visualization for better understanding of our world.**

- **The ArcGIS GeoEvent Extension for Server allows you to:**
  - **know what is happening, as it happens**
  - **react and make smarter decisions faster**
  - **be notified when interesting events occur**

Where to learn more?

Other Workshops

- **Configuring Real-Time Web Applications**
  - Mon 3:00pm-4:00pm (Hall D, Theater 3)
  - Tue 11:00am-12:00pm (Room 101)
- **ArcGIS GeoEvent Extension for Server: Best Practices**
  - Tue 1:30pm-2:30pm (Room 101)
- **ArcGIS GeoEvent Extension for Server: Applying Real-Time Analytics**
  - Tue 2:45pm-3:45pm (Room 101)
- **Web AppBuilder for ArcGIS: An Overview**
  - Mon 3:00pm-4:00pm (Room 103B)
  - Tue 5:15pm-6:15pm (Room 207B)
- **Operations Dashboard for ArcGIS: An Overview**
  - Tue 11:00am-12:00pm (Room 207B)
- **ArcGIS GeoEvent Extension for Server: Building Real-Time Web Applications**
  - Wed 1:00pm-1:45pm (Room 209A)

Where to learn more?

Resources

- **To learn more, visit the 'Get Started' area of the GeoEvent Extension product page:**
  - **http://links.esri.com/geoevent**
    - **Introduction**
    - **Notifications**
    - **Stream Services**
    - **RSS, HTTP, Files**
    - **REST Admin API**
    - **Clustering**

- **Ask questions on the GeoEvent Forum:**
  - **https://geonet.esri.com/community/gis/enterprise-gis/geoevent**

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Don’t forget to complete a session evaluation form!

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Interested in diving deeper into Esri technology?

Add a day to your Fed GIS experience and register to attend the Esri DevSummit Washington DC. Stop by the registration counter to sign up.

Questions / Feedback?

To learn more:

http://links.esri.com/geoevent

https://geonet.esri.com/community/gis/enterprise-gis/geoevent

Gary Sheppard
Solution Engineer
Esri, Federal Office
gsheppard@esri.com

esri

Understanding our world.

C. Adam Mollenkopf
Product Lead
Esri
amollenkopf@esri.com
@amollenkopf