

ArcGIS® GeoEvent Server

Introduction Tutorial

Lesson 3 – Filters



The Real-Time Visualization & Analytics Team strives to update product tutorials and abstracts to reflect the latest release. Depending on the version of ArcGIS GeoEvent Server you are using, there may be inconsistencies between your environment and the illustrations or specific steps in exercises or videos bundled with the abstract. The concepts outlined, however, should be applicable across different versions of GeoEvent Server.

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Tutorial overview

The Introduction to ArcGIS GeoEvent Server Tutorial is one of several tutorials that introduces you to the capabilities of [ArcGIS GeoEvent Server](#). The tutorial contains six lessons, each complementing one another by exploring different capabilities. If you are new to GeoEvent Server, you are encouraged to start with Lesson 1 and then work through the remaining lessons. If you are familiar with GeoEvent Server, you can skip to any other lesson depending on your learning objectives, you do not need to complete each lesson in order. Later lessons will assume you have some familiarity with GeoEvent Server.

The lessons include a GeoEvent Server product configuration that you will import. Each includes configured items such as inputs, outputs, GeoEvent Definitions, and GeoEvent Services that support the lesson. Carefully review the information on what is included in the configuration, as it may reset items you created as part of previous lessons and product exploration.

This tutorial does not provide information on installing, deploying, or managing ArcGIS GeoEvent Server. For information about deploying ArcGIS GeoEvent Server, see [Deployment considerations](#).

Access the other lessons [here](#). If you have questions, comments, or feedback on this tutorial, start a discussion on the [ArcGIS GeoEvent Server Community](#).

Tutorial prerequisites

Before getting started with the Introduction to GeoEvent Server Tutorial, review the following prerequisites.

- ArcGIS GeoEvent Server is installed, licensed, and configured in your organization. If not, see the following topics for your operating system to install GeoEvent Server:
 - [GeoEvent Server \(Windows\) installation guide](#)
 - [GeoEvent Server \(Linux\) installation guide](#)
- A managed relational geodatabase or ArcGIS Data Store is registered to ArcGIS Server. See [Register an ArcGIS Server managed database](#) for more information.
- ArcGIS Server must be licensed with the [ArcGIS GIS Server](#) and [ArcGIS GeoEvent Server](#) licensing roles.
- Exercises in this tutorial assume GeoEvent Server is installed on a single machine with ArcGIS Server. The exercises will leverage the **Default** connection to ArcGIS Server, accessible in **GeoEvent Manager** by navigating to **Site > GeoEvent > Data Stores**.

Lesson 3 overview

Lesson 3 introduces the concept of event data filtering. You will explore how [GeoEvent Definitions](#) and [tags](#) can be used in [filters](#) as well as how filter expressions can be logically combined to form more complex filters.

Once you have completed the exercises in this lesson you should be able to:

- Create a filter that filters attributes on the streaming event data.
- Create a filter that filters tagged fields.
- Create filters with multiple expressions combined with logical operators.
- Import and work with geofences to filter events based on spatial relationships.

Lesson 3 prerequisites

The prerequisites below must be completed before proceeding with the exercises in this lesson.

Prerequisite 1: Create a folder on the GeoEvent Server machine

To complete Lesson 3, you will create a new folder on the GeoEvent Server machine. This folder will be used with the file-based [outputs](#) in GeoEvent Server. If you already created the folder structure in previous lessons, proceed to the next prerequisite.

1. On the GeoEvent Server machine, create the folder structure below.

```
C:\GeoEvent\output
```

Prerequisite 2: Import a GeoEvent Server configuration

ArcGIS GeoEvent Server stores elements and settings in a configuration file (.xml). To complete this lesson, a GeoEvent Server configuration file is included to help get your GeoEvent Server environment configured with the required elements to complete the exercises below. For more information about working with GeoEvent Server configurations, see [Manage configurations](#).

Importing the configuration for this lesson will create the following items:

GeoEvent Definition	Vessels
Input	vessels-tcp-text-in
Output	file-json-out
Registered folder	GeoEvent_Output

NOTE: If an element with the specified names above already exists in your environment, importing this configuration will overwrite those elements. You will reset your GeoEvent Server configuration to remove items you created previously and import only the items necessary for this lesson.

Follow the steps below to reset and import the GeoEvent Server configuration for Lesson 3.

1. Open **ArcGIS GeoEvent Manager** and navigate to **Site > GeoEvent > Configuration Store**.
2. Click **Reset Configuration** and click **Yes** to confirm.

NOTE: *If you have anything else configured on this GeoEvent Server machine, resetting the configuration will delete everything from your configuration.*

3. Click **Import Configuration**.
4. Click **Choose File** and browse to the ...\\configuration folder included with this lesson and select the **Lesson_3.xml** file and click **Open** and then **Next**.
5. Leave **Import Configuration** selected and click **Import** to import the configuration.


NOTE: *It is best practice to stop any inputs, outputs, and GeoEvent Services before exporting a GeoEvent Server configuration. When imported, a started element may begin processing event data before you are ready for it to do so, contend with another running element, or import in an error state when an externally hosted socket connection, for example, is not yet available for a client connection.*

6. Navigate to the **Manager** page and click ► to start the **vessels-tcp-text-in** input.
7. Click ► to start the **file-json-out** output.



Prerequisite 3: Simulate real-time data


Next, you will use [GeoEvent Simulator](#) to simulate real-time event data to GeoEvent Server.

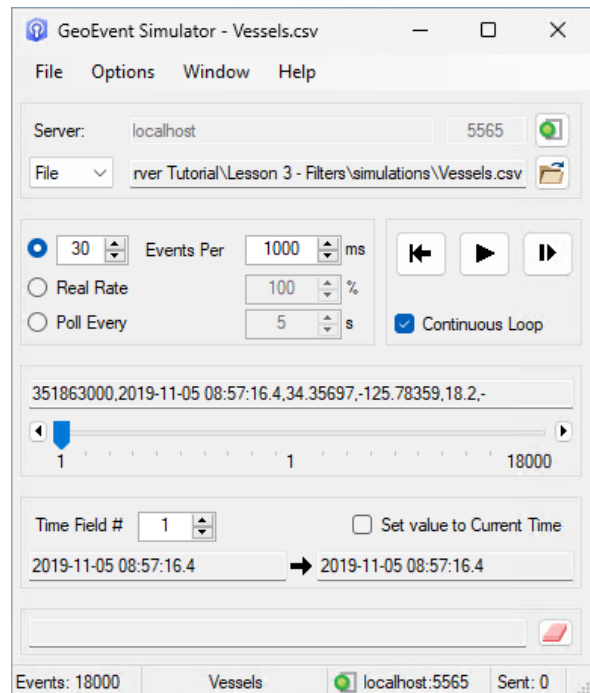
1. Open **GeoEvent Simulator** from the Windows **Start** menu or use the **GeoEventSimulator.exe** at: <ArcGIS Server installation directory>\\GeoEvent.

2. Click  to connect to the TCP input over the default TCP port **5565**.







The button changes to  indicating you are connected to the input.

3. Click , then click  again on the next dialog and browse to the ...\\simulations folder included with this tutorial.
4. Select **Vessels.csv** file and click **Open**.
5. Leave the default values for the **Event Separator** and **Field Separator** parameters.

6. For **Time Field #**, choose **1**.
7. Check the **Skip the First** checkbox and ensure **1 Lines** is selected.
This will skip the first row of the CSV file which contains the field names.
8. Click **Load** to load the file's data into GeoEvent Simulator.
9. Set the simulator to **30 Events Per 1000 ms**.
10. Click  to start the simulation.
11. In **GeoEvent Manager**, navigate to the **Manager** page and locate the **vessels-tcp-text-in** input and observe the **Count** column.



The count should be increasing, indicating the input is successfully ingesting the event data from the simulator.

Add Input						
	Count	Rate	Edit Rate	Max Rate	Time Since Last	
 vessels-tcp-text-in	30	3 /sec		3 /sec	00:00:00	   

It is recommended that you keep the simulator running to complete this lesson.

Lesson 3 exercises

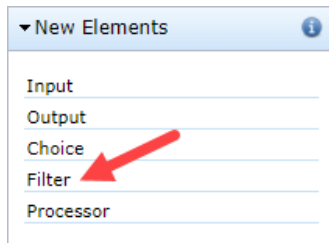
The exercises in this lesson focus on the event data filtering capabilities in GeoEvent Server. The ability to identify events of interest based on event attributes, proximity, or some combination of attribute and spatial relationship with an area of interest is important in most real-time workflows. [Filters](#) control what event data flows through a [GeoEvent Service](#), enabling you to define which events are sent to subsequent [processors](#) and [outputs](#). You will explore how to add and configure filters as well as how expressions are defined and logically combined.


Exercise 1: Filter based on attributes

First, you will add and configure an [attribute filter](#) to filter vessels from the AIS vessels data that are designated as cargo vessels. The filter will only process vessels where the **Cargo** field contains the value **1004** (the *VesselType* code for cargo as per NAIS specification).

1. In **GeoEvent Manager**, from the **Manager** page, click **Add Service**.
2. For **Service Name**, type **Cargo Vessels** and click **Create**.

- From the **New Elements** menu, double-click **Filter** to add a new filter to the GeoEvent Service.



- For **Name**, type Cargo Vessels and click  to add an expression.



- Configure the expression as follows:

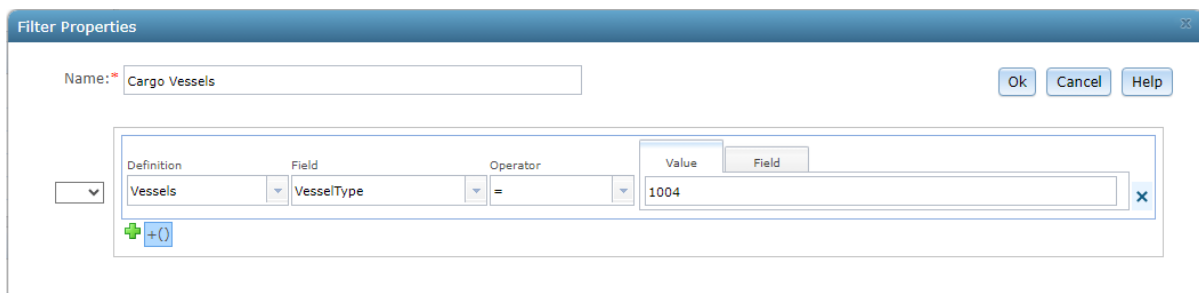
- For **Definition**, select **Vessels**.

NOTE: The specified GeoEvent Definition is not part of the filter's configuration. Selecting an event definition helped narrow your choices when configuring the filter, but the filter will be applied to all event data it receives. Any existing [GeoEvent Definitions](#) available in your site are listed in the **Definition** parameter. The selected GeoEvent Definition determines the choices available in the **Field** parameter, since only fields applicable to the selected GeoEvent Definition are shown.

- For **Field**, select **VesselType**.
- For **Operator**, select **=**.


NOTE: Choosing a **Field** determines the items presented in the **Operator** parameter; only operators applicable to the data type of the selected field are shown.

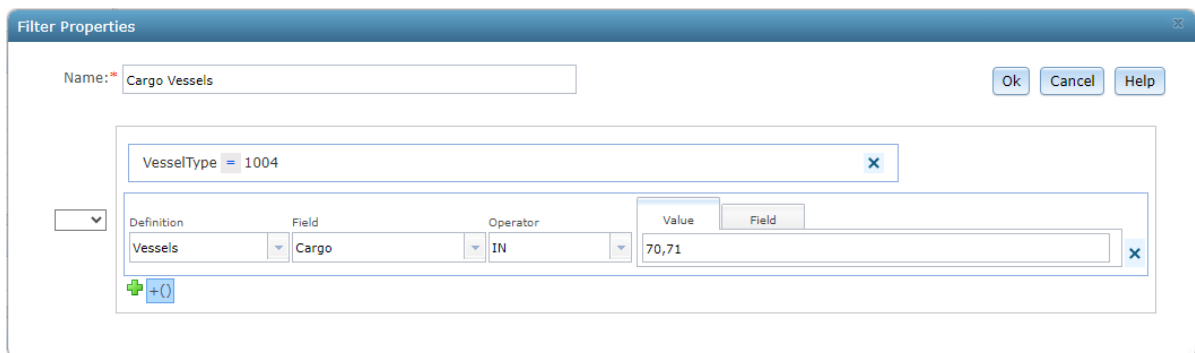
- For **Value**, type 1004.



This will filter out all other vessel types and only allow cargo vessels to pass through.

You have configured a valid expression that can be used to filter event records. Filters allow additional expressions to be combined with AND/OR logical operators. Follow the steps below to configure an additional expression.

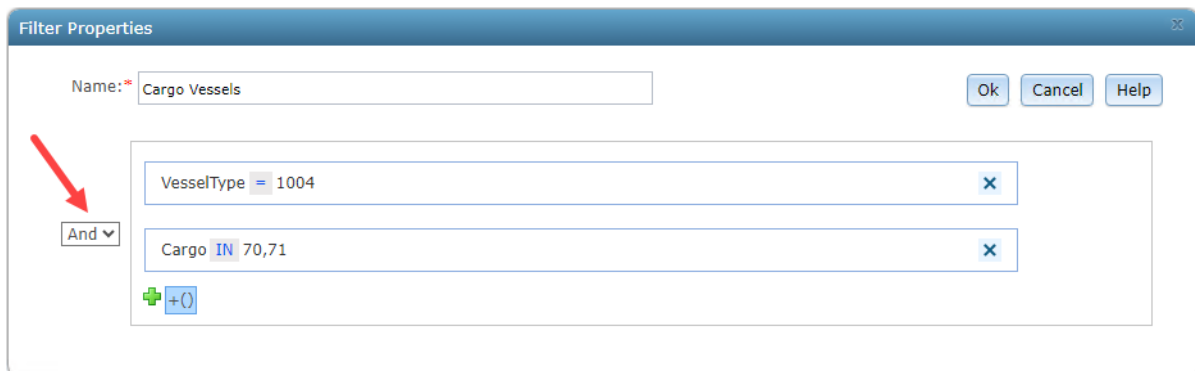
6. Click  to add another expression.
7. Configure the expression as follows:
 - a. For **Definition**, select **Vessels**.
 - b. For **Field**, select **Cargo**.
 - c. For **Operator**, select **IN**.
 - d. For **Value**, type 70,71.



The screenshot shows the 'Filter Properties' dialog box. The 'Name' field is 'Cargo Vessels'. There are 'Ok', 'Cancel', and 'Help' buttons. Below the name field, there is a table with columns: Definition, Field, Operator, Value, and Field. The first row shows 'VesselType = 1004'. Below this, there is a table with columns: Definition, Field, Operator, Value, and Field. The first row shows 'Vessels', 'Cargo', 'IN', '70,71'. There is a '+()' button at the bottom left of the table.

This filter will only allow event records with cargo type 70 and 71 through to your downstream [processors](#) and [outputs](#). Next, you will use a logical operator to combine these expressions.

8. From the drop-down menu, select the **And** logical operator.



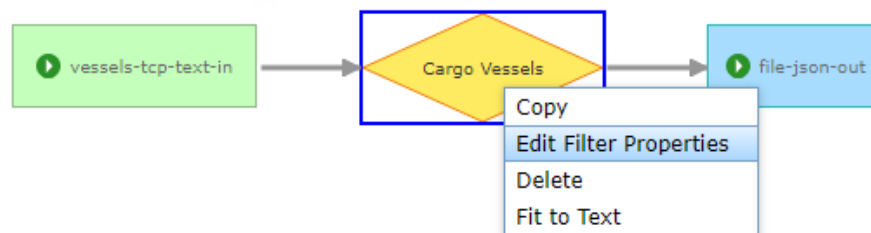
The screenshot shows the 'Filter Properties' dialog box. The 'Name' field is 'Cargo Vessels'. There are 'Ok', 'Cancel', and 'Help' buttons. Below the name field, there is a table with columns: Definition, Field, Operator, Value, and Field. The first row shows 'VesselType = 1004'. The second row shows 'Cargo IN 70,71'. A red arrow points to the 'And' logical operator in the drop-down menu.

Using the **And** operator will ensure that both expressions must be satisfied for event data to pass through the filter.

9. Click **OK** to add the filter to the GeoEvent Service.
10. Add the **vessels-tcp-text-in** input and **file-json-out** output to the service designer.
11. Configure the GeoEvent Service as illustrated below.



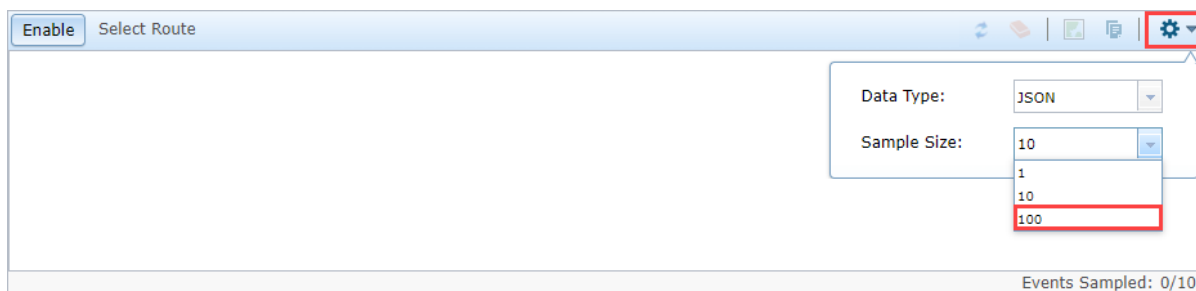
NOTE: You can access additional actions by right-clicking an element including copying, editing properties, and more. Alternatively, you can double-click an element to open its properties.



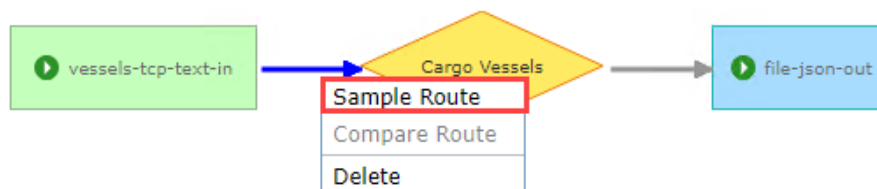
12. Click **Publish** to publish the GeoEvent Service.

You will now use [GeoEvent Sampler](#) to sample and view the event data as it is processed in the GeoEvent Service.

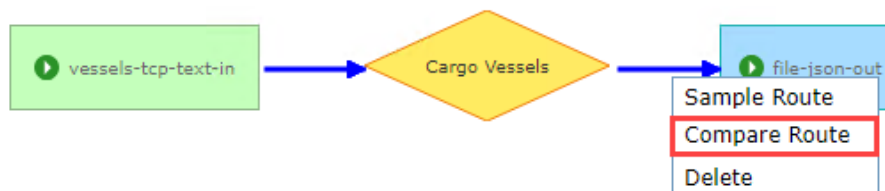
13. In **GeoEvent Sampler**, click  and for **Sample Size** select **100**.

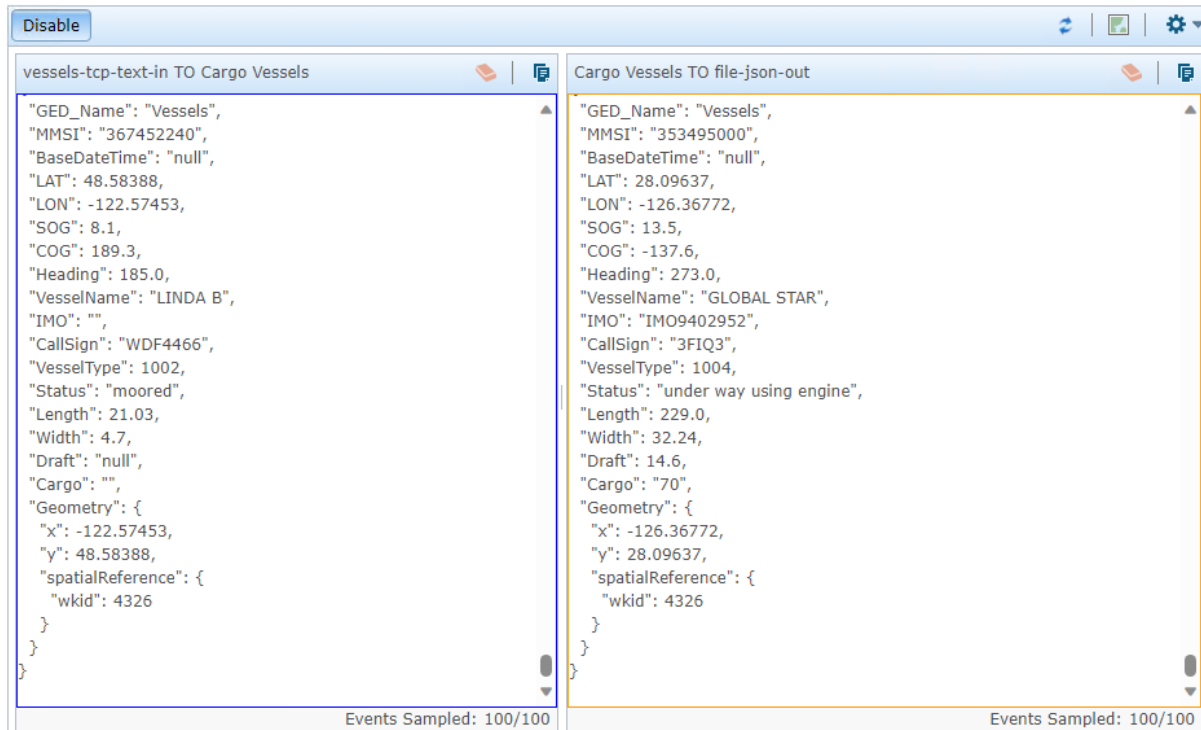


14. Right-click the route between the input and the filter and select **Sample Route**.




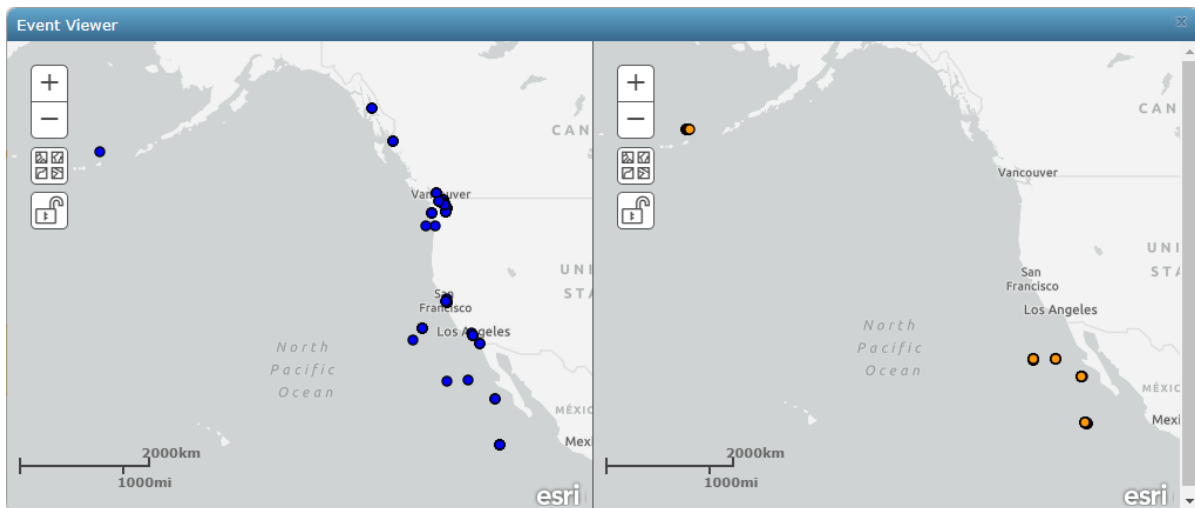
15. Right-click the route between the filter and the output and select **Compare Route**.











In **GeoEvent Sampler**, you will see the data before being processed by the filter on the left and the data after being processed by the filter on the right.

16. Wait until the **Events Sampled** count reaches **100/100**, then click  to view the sampled event data in the **Event Viewer**.



You can visually verify the event records are successfully being filtered on the map on the right.

You can also verify the counts in and out for the input and output are different, indicating the filter is filtering out vessels that is sends to the output.

Status	In/Out	Count	Rate (over last 5 mins)	Edit Rate	Max Rate	Time Since Last	View Graph	Action
STARTED	In	16,830	29 /sec		45 /sec	00:00:00		  
	Out	2,805	5 /sec		8 /sec	00:00:00		

Exercise 2: Filter based on tagged fields

In this next exercise you will perform filtering on the vessels event data using a tagged field. When configuring a [filter](#) and [processor](#) you can specify a [tag](#) rather than the field name; GeoEvent Server uses the tag to identify the event field.

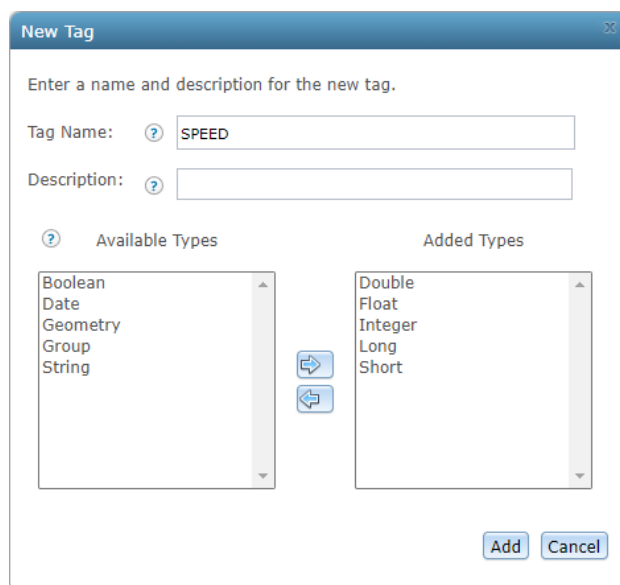
Let's explore a use case, suppose you have many vessels you are monitoring. The vessels are configured with different models of AIS reporting devices that provide real-time information. Unlike the previous example in which the events were essentially the same (one simply included an additional field), suppose the schema of the events being reported by the different devices were significantly different.

Considering one attribute in particular – a vessel's current speed – you discover that events for one type of vessel reports this value as `Speed`, while another type of vehicle reports the exact same information as `Rate`. Other vessels might report the vessel's speed as `Acceleration` or simply `VehicleSpeed`.

One way to address the issue of similar information being reported across different field names is to create and use tags to identify the similar fields. [Tags](#) are created in GeoEvent Manager and new tags can be created to support your specific requirements.

You will create a new tag that will be applied to the **Vessels** GeoEvent Definition.



1. In **GeoEvent Manager**, navigate to **Site > Tags**.
2. Click **New Tag** and specify the parameters as follows:
 - a. For **Tag Name**, type **SPEED**.
 - b. Hold down **Control** key to select **Double**, **Float**, **Integer**, **Long**, and **Short** and move them to the **Added Types**.




















- c. Click **Add** to add the new tag.

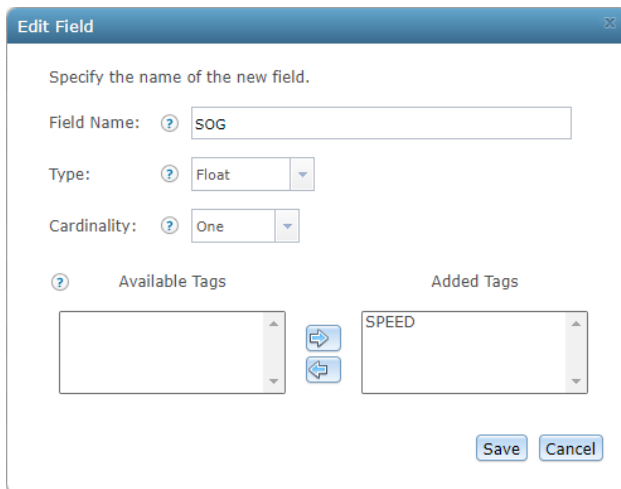
NOTE: The data type is important, as the tag can only be applied to fields in a GeoEvent Definition with the same field type.


Once the new tag is created, you can apply the tag to fields in your GeoEvent Definitions.

3. Navigate to **Site > GeoEvent Definitions**.
4. Click  to edit the **Vessels** GeoEvent Definition.
5. Click  to edit the **SOG** field.

Name	Type	Cardinality	Tags	Action
MMSI	String	1	TRACK_ID	 
BaseDateTime	Date	1	TIME_START	 
LAT	Double	1		 
LON	Double	1		 
SOG	Float	1		 
COG	Float	1		 
Heading	Float	1		 
VesselName	String	1		 
IMO	String	1		 

6. Move the **SPEED** tag to **Added Tags** and click **Save**.



7. Click **Save** and then click **Yes** to confirm changes to the **Vessels** GeoEvent Definition.
8. Navigate to the **Manager** page and open the **Cargo Vessels** GeoEvent Service.
9. From the **New Elements** menu, double-click **Filter** and specify the parameters as follows.
 - a. For **Name**, type **Is Moving**.
 - b. Click  to add an expression.
 - c. For **Definition**, select *****.

- d. For **Field**, select the **SPEED** tag.
- e. For **Operator**, select the **>** operator.
- f. For **Value**, type 0.

Filter Properties

Name:

Ok Cancel Help

Definition	Field	Operator	Value	Field
*	SPEED	>	0	

+ ()

10. Click **OK** to add the new filter to the GeoEvent Service.

11. Connect the new filter to the other elements as illustrated below:



12. Click **Publish** to publish the updated GeoEvent Service.

Using a **SPEED** tag to specify an event field rather than the field names abstracts the differences in the GeoEvent Definitions. All events in this case are assumed to have some sort of attribute which corresponds to the vessel's speed – and the GeoEvent Service's filter no longer cares what the event field names are, or if they change, so long as it can find a field tagged **SPEED**.

The GeoEvent Service is now filtering out vessels that are not cargo vessels and that are not anchored or docked. Cargo vessels that are currently under way (or moving) will be sent to the output.

Exercise 3: Filter based on spatial conditions

Filters can use an event's associated geometry to test a spatial condition or determine if a spatial relationship exists between the event's geometry and another geometry.

To configure a [spatial filter](#), you will import [geofences](#) into GeoEvent Server. A geofence represents a point, multipoint, polyline, or polygon geometry that can be used for spatial proximity analysis.

After importing geofences, you will create a GeoEvent Service that incorporates a spatial filter whose expression requires that vessels position be inside a boundary for the event to pass through the filter.


If your machine can access the internet

NOTE: Follow the steps in this section if your GeoEvent Server machine **can** connect to the internet. If not, proceed to the next section [here](#) to complete steps for importing geofences if your machine cannot connect to the internet.

Follow the steps below to import geofences from a feature service using a registered server connection.

1. In **GeoEvent Manager**, navigate to **Site > GeoEvent > Data Stores** and click **Register server connection**.
2. For **Name**, type US Coast Guard Districts.
3. For **URL**, enter <https://services2.arcgis.com/FiaPA4ga0iQKduv3/arcgis> and click **Register**.

4. Navigate to **Site > GeoEvent > GeoFences** and click **Import** to import geofences.
5. On the **Import GeoFences** dialog, specify the parameters as follows:
 - a. For **Registered Server Connection**, select **US Coast Guard Districts**.
 - b. (In GeoEvent Server 11.0 and later) For **Reference to Layer Type**, select **Browse to Layer**.
 - c. For **Folder**, choose **Root**.
 - d. For **Service**, select **US_Coast_Guard_Districts_new (Feature Services)**.

NOTE: If you are using GeoEvent Server 10.9.1 and earlier, the service may not appear right away. Navigate to **Site > Data Stores** and click the  button for the **Default** and **US Coast Guard Districts** data stores. Allow some time before returning to the **Import GeoFences** dialog. The sync time may be longer if your ArcGIS Server has many services.

- e. For **Layer**, select **USCG_Districts (0)**.
- f. For **Category Field**, select **AreaName**.
- g. Leave the **Replace All Geofences in Category** checkbox checked.
- h. For **Name Field**, select **DistrictName**.
- i. Leave all the other parameters set to their default values.

Import GeoFences

Registered Server Connection:* ? US Coast Guard Districts

Reference to Layer Type: ? Browse to Layer

Folder:* ? Root

Service:* ? US_Coast_Guard_Districts_new (FeatureServer)

Layer:* ? USCG_Districts (0)

Category Field:* ? AreaName

? ☒ Replace All GeoFences in Category

Name Field:* ? DistrictName

Active Field: ? (Always Active)

GeoSync Filter Field: ? -- Choose Field --

Refresh Interval: ? 15 Minutes

WKID: ? 4326

Max Allowable Offset: ?

Time Extent Start: ? -- Choose Field --

Time Extent End: ? -- Choose Field --

Query Definition: ? 1=1

Import Cancel

6. Click **Import**.




























Notice the new geofences that were imported.

GeoFences

Category: All Categories


Search All Categories Delete Manage

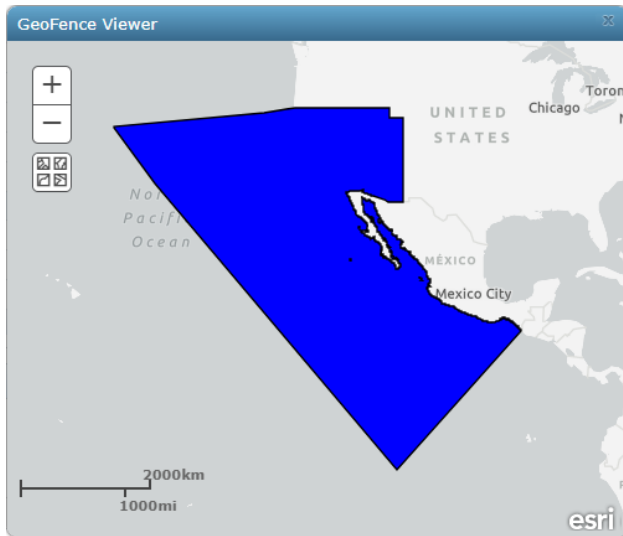
GeoFences: Import Delete Selected Delete All

<input type="checkbox"/> Category	Name	Active	Action
<input type="checkbox"/> Atlantic Area	District 1	true	  
<input type="checkbox"/> Atlantic Area	District 5	true	  
<input type="checkbox"/> Atlantic Area	District 7	true	  
<input type="checkbox"/> Atlantic Area	District 9	true	  
<input type="checkbox"/> Atlantic Area	District 8	true	  
<input type="checkbox"/> Pacific Area	District 11	true	  
<input type="checkbox"/> Pacific Area	District 13	true	  
<input type="checkbox"/> Pacific Area	District 14	true	  
<input type="checkbox"/> Pacific Area	District 17	true	  

1 - 9 of 9 results

<< < 1 > >> 15

7. Click  for **District 11** and note the area this geofence covers.



8. Close the **Geofence Viewer**.

If your machine cannot access the internet (optional)


NOTE: Follow the steps in this section only if your GeoEvent Server machine is **not** able to access the internet, and you were not able to perform the steps in the previous section.

If you are in a closed environment, with no access to the internet, you can load a service definition file (.sd) included with this lesson to publish a map service to your local server that you can then use to import geofences.

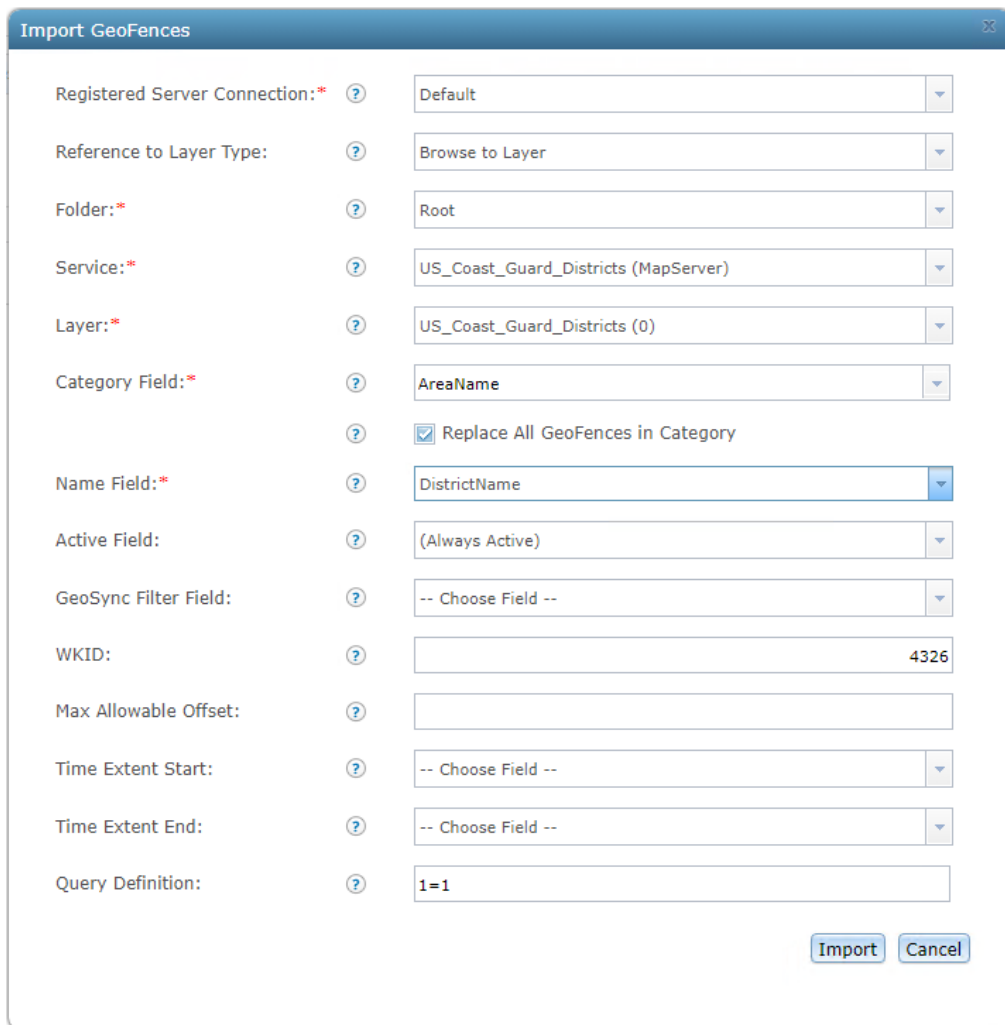
1. Open **ArcGIS Server Manager** by clicking **Server Manager** at the top right corner of the **ArcGIS GeoEvent Manager**.
2. In **ArcGIS Server Manager**, navigate to the **Services** page and click **Publish Service**.
3. Click **Choose File** and select the **US_Coast_Guard_Districts.sd** file in the `data` folder included with this lesson and click **Open** and then **Next**.
4. Ensure **Start service immediately** is checked and click **Next**.
5. Keep all default capabilities and click **Publish**.

The service named **US_Coast_Guard_Districts** should now be published to your ArcGIS Server. You can now import the features in this features service as geofences in GeoEvent Server.

6. In **GeoEvent Manager**, navigate to **Site > GeoFences**.
7. Click **Import** and specify the parameters as follows:
 - a. For **Registered Server Connection**, select **Default**.
 - b. (In GeoEvent Server 11.0 and later) For **Reference to Layer Type**, select **Browse to Layer**.
 - c. For **Folder**, choose **Root**.
 - d. For **Service**, select **US_Coast_Guard_Districts (Map Services)**.

NOTE: If you are using GeoEvent Server 10.9.1 and earlier, the service may not appear right away. Navigate to Site > Data Stores and click the  button for the Default and US Coast Guard Districts data stores. Allow some time before returning to the Import GeoFences dialog. The sync time may be longer if your ArcGIS Server has many services.

- e. For **Layer**, select **US_Coast_Guard_Districts (0)**.
- f. For **Category Field**, select **AreaName**.
- g. Leave the **Replace All Geofences in Category** checkbox checked.
- h. For **Name Field**, select **DistrictName**.
- i. Leave all the other parameters set to their default values.



Import GeoFences

Registered Server Connection: * ? Default

Reference to Layer Type: ? Browse to Layer

Folder: * ? Root

Service: * ? US_Coast_Guard_Districts (MapServer)

Layer: * ? US_Coast_Guard_Districts (0)

Category Field: * ? AreaName

? ☒ Replace All GeoFences in Category

Name Field: * ? DistrictName

Active Field: ? (Always Active)

GeoSync Filter Field: ? -- Choose Field --

WKID: ? 4326

Max Allowable Offset: ?

Time Extent Start: ? -- Choose Field --

Time Extent End: ? -- Choose Field --


Query Definition: ? 1=1

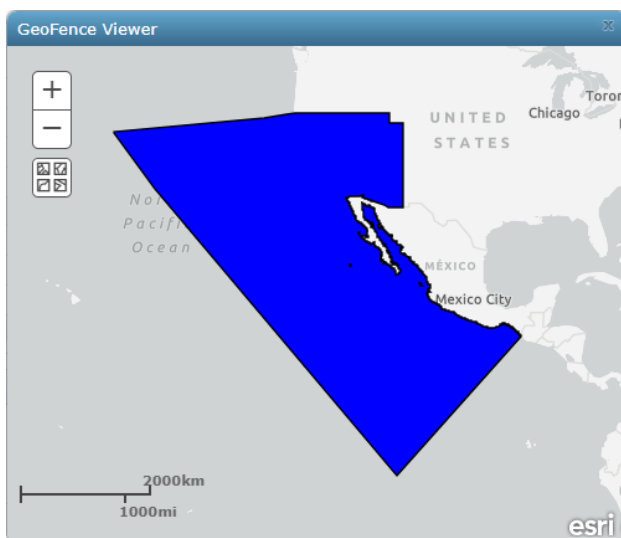
Import Cancel

- 8. Click **Import** to import the geofences.

Notice the new geofences that were imported.

▼ GeoFences				
Category: All Categories			GeoFences:	
Search	All Categories	Delete	Manage	Import
<input type="checkbox"/> Category	▲ Name	Active	Action	
<input type="checkbox"/> Atlantic Area	District 1	true		
<input type="checkbox"/> Atlantic Area	District 5	true		
<input type="checkbox"/> Atlantic Area	District 7	true		
<input type="checkbox"/> Atlantic Area	District 9	true		
<input type="checkbox"/> Atlantic Area	District 8	true		
<input type="checkbox"/> Pacific Area	District 11	true		
<input type="checkbox"/> Pacific Area	District 13	true		
<input type="checkbox"/> Pacific Area	District 14	true		
<input type="checkbox"/> Pacific Area	District 17	true		
1 - 9 of 9 results				
<div> << < 1 > >> <div>15</div> </div>				

9. Click  for **District 11** and note the area that this geofence covers.




10. Close the **Geofence Viewer**.

Next, you will update the **Vessels** GeoEvent Service to incorporate [spatial filters](#). The spatial filter's expression will require an event's geometry to be in a specified geofence for the event to pass through the filter.

Configure the filter

11. In **GeoEvent Manager**, navigate to the **Manager** page and open the **Cargo Vessels** GeoEvent Service.

12. Double-click **Filter** and specify the parameters as follows:

- For **Name**, type Within District 11.
- Click  to add an expression.
- For **Definition**, select *****.
- For **Field**, select the **GEOMETRY** tag (under **TAGS**).

- e. For **Operator**, select **WITHIN**.
- f. For **Geofence**, select **Any**, **Pacific Area**, and **District 11**.

Filter Properties

Name: Within District 11

Definition: * Field: GEOMETRY Operator: WITHIN Geofence: Any Pacific Area District 11

Buttons: Ok, Cancel, Help


The filter will only allow event records through that are inside the District 11 geofence.

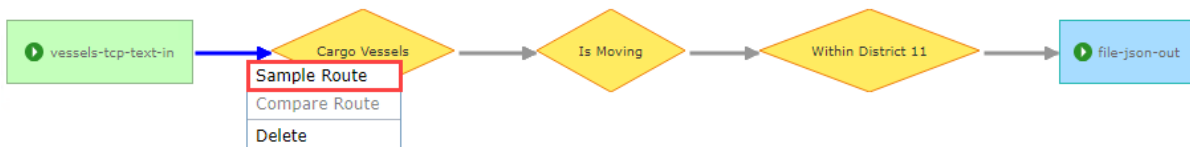
13. Click **OK** to add the new filter to the GeoEvent Service.
14. Connect the new filter to the other elements as illustrated below.



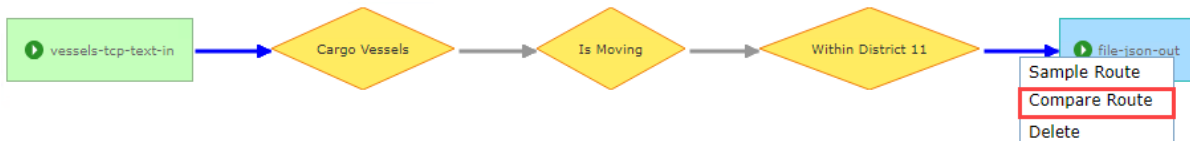
15. Click **Publish** to save the GeoEvent Service.


You will now use [GeoEvent Sampler](#) to sample and view the event data as it is processed in the GeoEvent Service.

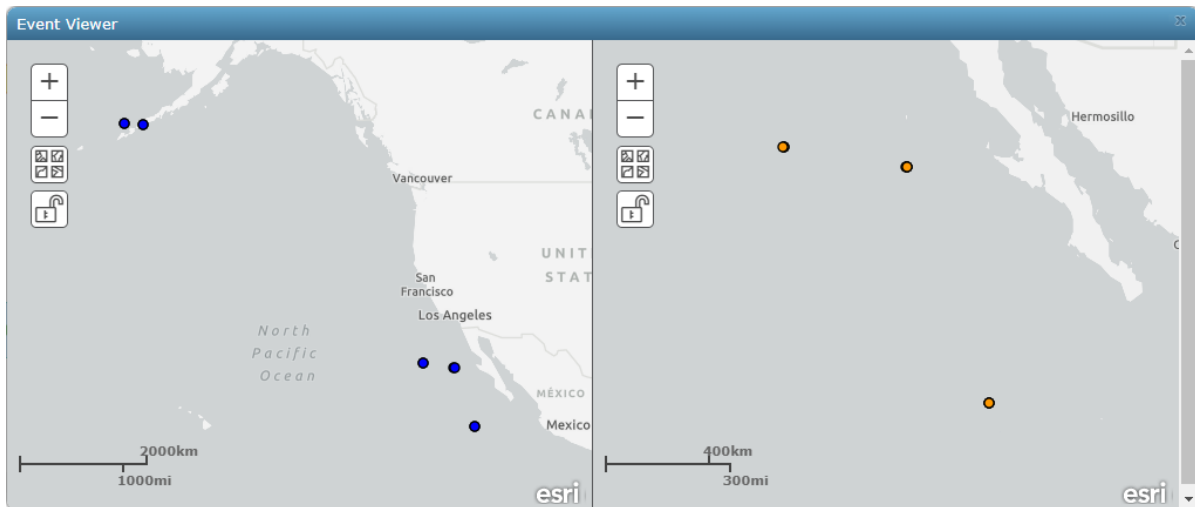
16. In **GeoEvent Sampler**, click  and for **Sample Size** select **10**.
17. Right-click the highlighted route below and click **Sample Route**.



18. Right-click the highlighted route below between the filter and the output and click **Compare Route**.



19. Wait until the **Events Sampled** count reaches **10/10**, then click  to view the sampled event data in the **Event Viewer**.



Compare the events sampled on the left to the ones on the right. Only cargo vessels located in District 11 are displayed on the map. Refer to the illustration in the previous section of the District 11 geofence boundary.

Lesson clean-up

With the lesson complete, you can now perform the following tasks to clean-up your GeoEvent Server machine, if necessary.

- Reset your GeoEvent Server configuration in **GeoEvent Manager** by navigating to **Site > GeoEvent > Configuration Store** and click **Reset Configuration**.
- If you optionally published the **US_Coast_Guard_Districts** service to your local server because you could not access the internet, you can delete the service.
- Delete the folder and files under the following directory:
C:\GeoEvent\output

Summary

By completing the exercises in this lesson, you learned how to add and configure [filters](#) in a GeoEvent Service. You also learned how to add filters that filter event data by attributes, tagged fields, and spatial conditions. In addition, you learned how expressions can be logically combined in a single filter using AND/OR operations. And lastly, you learned how to import geofences – necessary when filtering events based on their location.

In Lesson 4, you will explore several of the frequently used [processors](#) available in GeoEvent Server. Combined with the event filtering knowledge you gained above and the skills you will learn in the remaining processor focused lessons, you will have a solid understanding of the real-time capabilities that will support all the real-time use cases in your organization.