ArcGIS® GeoEvent Server

Introduction Tutorial

Lesson 2 – Visualize Real-Time Data

Contents

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 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 on deploying ArcGIS GeoEvent Server in your environment, 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:

    o [GeoEvent Server (Windows) installation guide](#)

    o [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 2 overview

In Lesson 2, you will learn how to register and modify server connections in [ArcGIS GeoEvent Manager](#). You will also learn how to create a stream service output that will send data to a [stream service](#) that you can visualize in a web map as well as create an output to send updates to a feature service. Lastly, you will use [GeoEvent Simulator](#) to simulate Marine Cadastre Automatic Identification System (AIS) data to GeoEvent Server.

After completing the exercises in this lesson, you will be able to:

- Import a GeoEvent Server configuration.
- Create output connectors.
- Publish a stream service and feature service using GeoEvent Manager.
- Configure a GeoEvent Service to send event data to a stream service and feature service.
- Add a stream service to a web map.

Lesson 2 prerequisites

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

Prerequisite 1: 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

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 2.

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_2.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 locate the **vessels-tcp-text-in** input.

7. Click ▶ to start the **vessels-tcp-text-in** input.

Prerequisite 2: 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 [X] 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 1 Lines** checkbox.

   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.
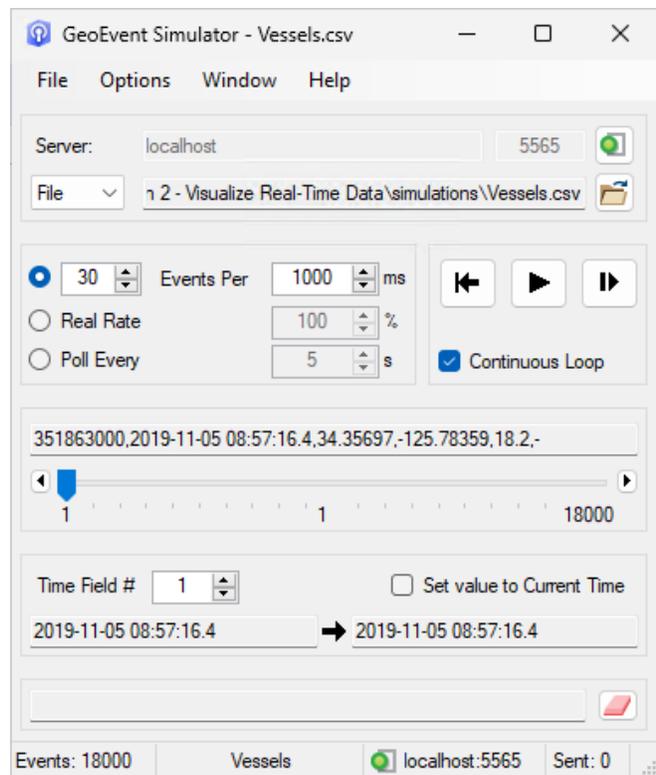
11. In **GeoEvent Manager**, from the **Manager** page, locate the **vessels-tcp-text-in** input and observe the **Count** column.

The count should be increasing, indicating the input is successfully ingesting the event data from the simulator.
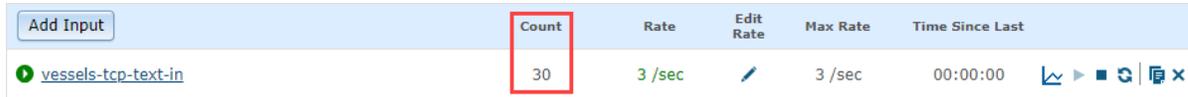
It is recommended that you keep the simulator running to complete the rest of this lesson.

Prerequisite 3: Register a server connection

In **GeoEvent Manager**, you can access and register data stores for use in GeoEvent Server. When GeoEvent Server is installed, a **Default** registered data store connection is available that connects to the ArcGIS Server running on the local server.
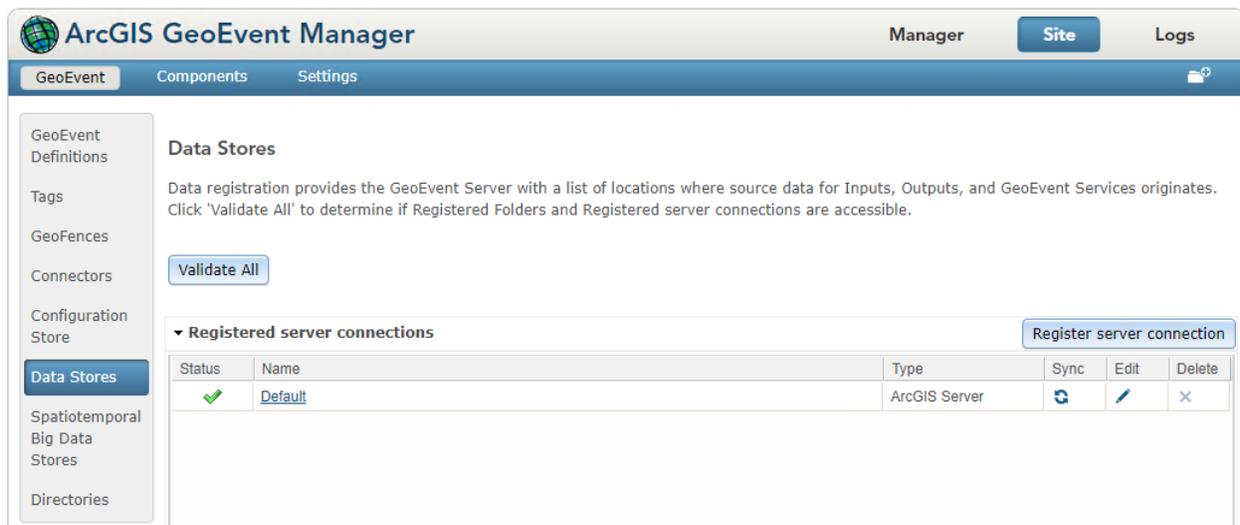
Exercises in this tutorial assume GeoEvent Server is installed and licensed on a single ArcGIS Server machine. This lesson leverages the **Default** connection to ArcGIS Server. For more information on working with data stores in GeoEvent Server, see Manage data stores.

You will edit the existing default connection with credentials to your ArcGIS Server site. This is required to complete this lesson.

1. In **GeoEvent Manager**, navigate to **Site** > **GeoEvent** > **Data Stores**.

2. Click ✎ to edit the **Default** registered server connection.

3. Check the **Use Credentials** checkbox and type your primary site administrator username and password for your ArcGIS Server.

NOTE: If your GeoEvent Server site is federated with Portal, the Default connection will be an ArcGIS Enterprise connection. You will need to enter credentials of an account that has at least publishing capabilities in your ArcGIS Enterprise portal.

4. Click **Register** to save the data store connection.

   If the updates were successful, a green checkmark will appear next to the **Default** connection.

Lesson 2 exercises

In the following exercises, you will create a web map that displays the real-time positions of vessels in the Pacific Ocean, off the coast of the United States. To accomplish this, you will create an output connector that will send the vessels location data to a stream service. You will then add the stream service to a web map and define its symbology. You will also create a feature service output that can be used to store the historical tracks of the vessels.

Exercise 1: Add a stream service output

First, you will create a new output, specifically an output to send the vessel AIS event data to a stream service, which you will then visualize in a web map. Follow the steps below to create a stream service.

5. In **GeoEvent Manager**, on the **Manager** page, click **Add Output**.

6. Under the **Stream Service** category, select the **Send Features to a Stream Service** output and specify the parameters as follows:

   a. For **Name**, type `vessels-stream-service-out`.

   b. For **Registered server connection**, select **Default**.

c. (In GeoEvent Server 11.0 and later) For **Reference to Layer Type**, select **Browse to Layer**.

d. For **Folder**, select **Root**.

   NOTE: Stream services can only be published to the root directory of ArcGIS Server.

e. Click **Publish Stream Service** and set the parameters as follows:

   NOTE: If the button is grayed out, see Prerequisite 3 above. The ArcGIS Server machine that GeoEvent Server is installed on must have a GIS Server license role applied. For more on licensing roles, see [ArcGIS Server licensing roles](#).

   i. For **Name**, type `vessels_stream`.

   ii. For **GeoEvent Definition**, select **vessels**.

   iii. Leave the other parameters set to their default values.

7. Click **Publish**.

8. Click **Save** to save the new output.

9. Click ▶ to start the **vessels-stream-service-out** output.

Next, you will add and publish a [GeoEvent Service](#).

10. In **GeoEvent Manager**, on the **Manager** page, click **Add Service**.

11. For **Name**, type `vessels` and click **Create**.

12. From **Inputs**, drag-and-drop the **vessels-tcp-text-in** input into the service designer.

13. From **Outputs**, double-click the **vessels-stream-service-out** output to add it to the service designer.

14. Connect the input to the output as illustrated below.

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

Once the **vessels** GeoEvent Service is started, note the count for events in and out are increasing, meaning that the input is receiving the event data and sending it to the output.

Exercise 2: Add the stream service to a web map

With the vessel AIS event data streaming in the GeoEvent Service, you will now add the stream service to a web map and symbolize the vessel features.

Follow the steps below to add the map to the ArcGIS Online Map Viewer.

NOTE: *The ArcGIS Online Map Viewer is free to use without creating an account. If you want to use your ArcGIS Enterprise portal Map Viewer, proceed to the steps here. Note that stream services are only supported in the Map Viewer Classic if you decide to use the ArcGIS Enterprise portal Map Viewer.*

Use the ArcGIS Online Map Viewer

To use the ArcGIS Online Map Viewer, follow the steps below to add the stream service to a web map.

1. Sign in to your ArcGIS account.

2. On the ribbon, click the **Map** tab.

3. In another tab, navigate the ArcGIS Server REST Services Directory endpoint that the stream service is published (typically, at `https://gisserver.domain.com:6443/arcgis/rest`).

4. Click **Login** at the top right corner of the page if you are not logged in already.

5. In the **root** folder, click the **vessels_stream** stream service.

6. In the browser address bar, copy the URL for the stream service (for example, `https://gisserver.domain.com:6443/arcgis/rest/services/vessels-stream/StreamServer`).

7. In the **Map Viewer**, click the **Add** menu drop-down menu and select **Add layer from URL**.
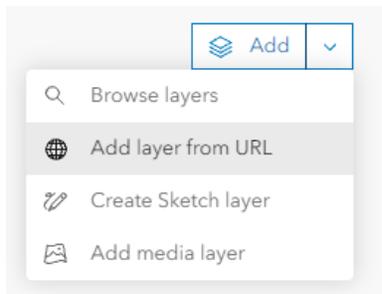
8. For **URL**, paste the URL for the stream service you copied and click **Add to map**.

    NOTE: *If your server is secured or is federated with ArcGIS Enterprise portal, you may be prompted to enter your credentials.*

    The stream service is added to the web map and the vessels should be updating in the map.
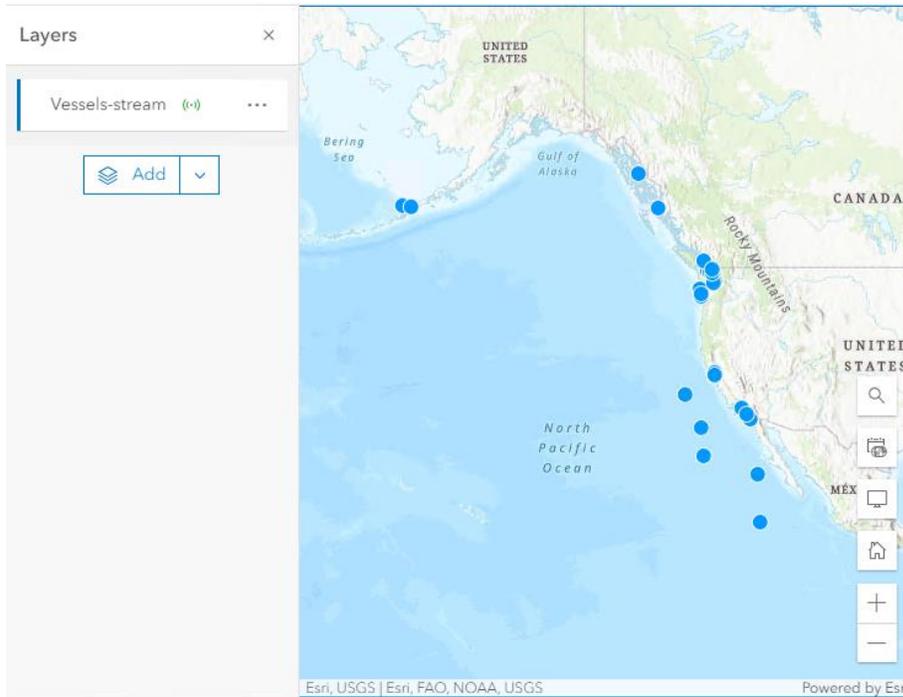
The vessel data contains a `Heading` field that can be used to symbolize the features in the map based on their current heading.

9. After adding the stream service, click to open the **Styles** tab.

10. Under **Pick a style**, click **Style options**.
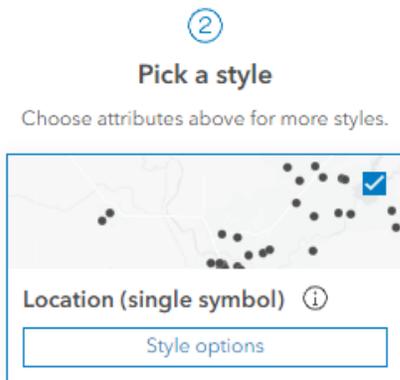
11. Click **Symbol style** and select **Basic point**.
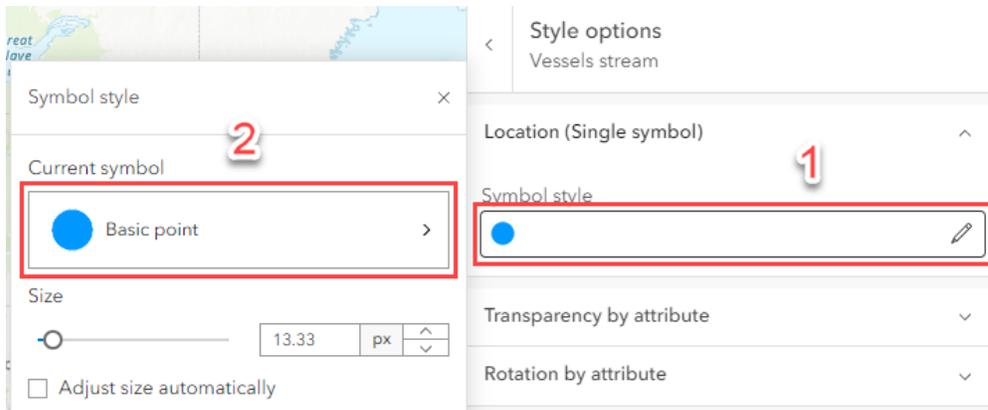
12. From the **Category** menu, select **Arrows** and then select ⬤.

13. Click **Done**.

14. For **Size**, type 20.
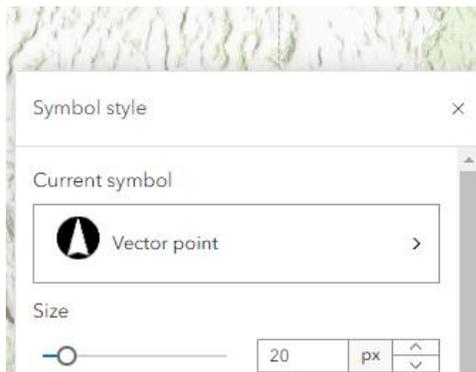
15. Close the **Symbol style** panel.

16. In the **Style options** panel, click **Rotation by attribute** and toggle on **Rotate symbols based on attribute values**.
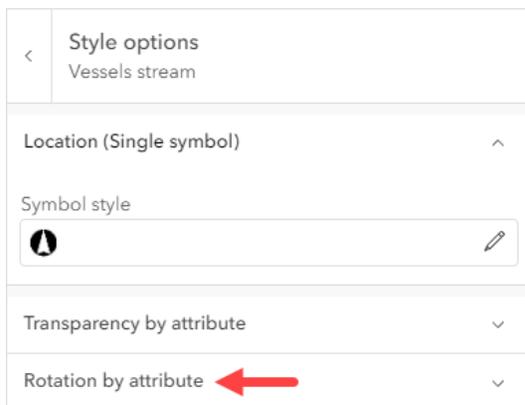

17. For **Field**, select **Heading**.
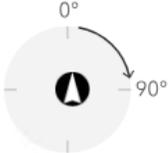
18. Click **Done** twice to save the symbol style.

The vessels in the map are symbolized and oriented in the direction they are heading.
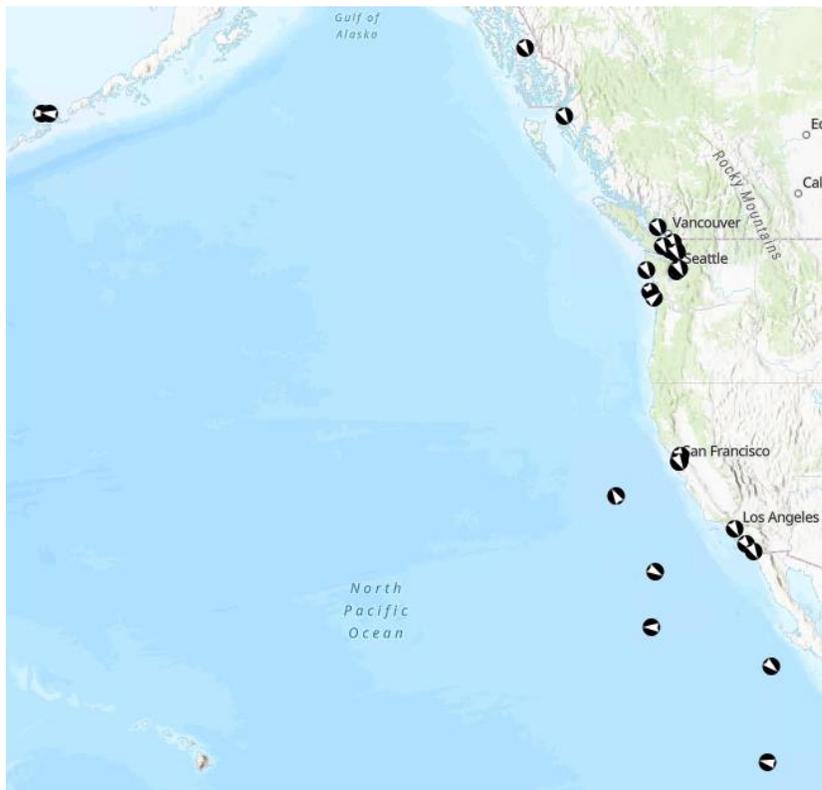
Use the ArcGIS Enterprise portal Map Viewer Classic (optional)

To use your ArcGIS Enterprise portal Map Viewer Classic, follow the steps below to add the stream service to a web map and symbolize the features.

1. In a browser, open your ArcGIS Enterprise portal (typically, at `https://portal.domain.com:7443`).

2. Click **Map**.

3. In another tab, navigate to the ArcGIS Server REST Services Directory endpoint that the stream service is published (typically, at `https://gisserver.domain.com:6443/arcgis/rest`).

4. Click **Login** at the top right corner of the page if you are not logged in already.

5. In the **root** folder, click the **vessels-stream** stream service.

6. In the browser address bar, copy the URL for the stream service (for example, `https://gisserver.domain.com:6443/arcgis/rest/services/vessels-stream/StreamServer`).

7. In the **Map Viewer Classic**, click the **Add** menu and select **Add layer from Web**.

8. For **URL**, paste the URL for the stream service you copied and click **ADD LAYER**.

   NOTE: *If your server is secured or is federated with ArcGIS Enterprise portal, you may be prompted to enter your credentials.*

   You should now see the vessels updating in the map.

9. In the table of contents, hover over the **vessels_stream** layer and click ◭ to change the style of the layer.

10. Click **Symbols**.

11. Click the drop-down menu and select **Arrows**.

12. Select the arrow and enter the symbol size as illustrated below.
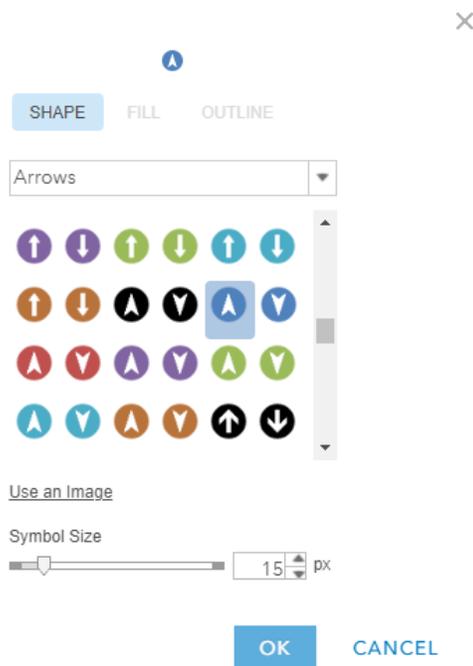
13. Click **OK**.

14. Check the **Rotate symbols (degrees)** checkbox and from the menu, select **Heading**.
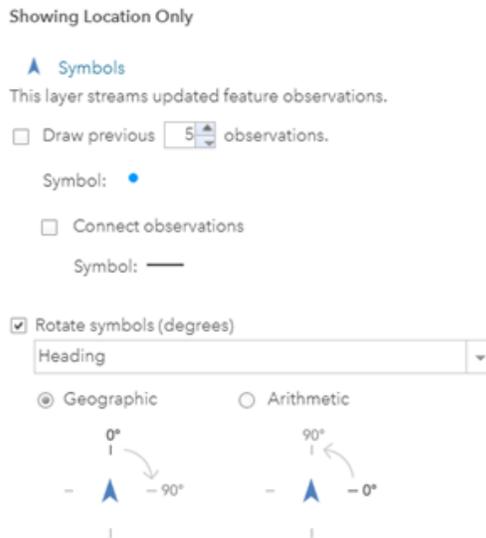
15. Click **OK** to save the style.

The vessels are now symbolized and rotated based on their current heading.
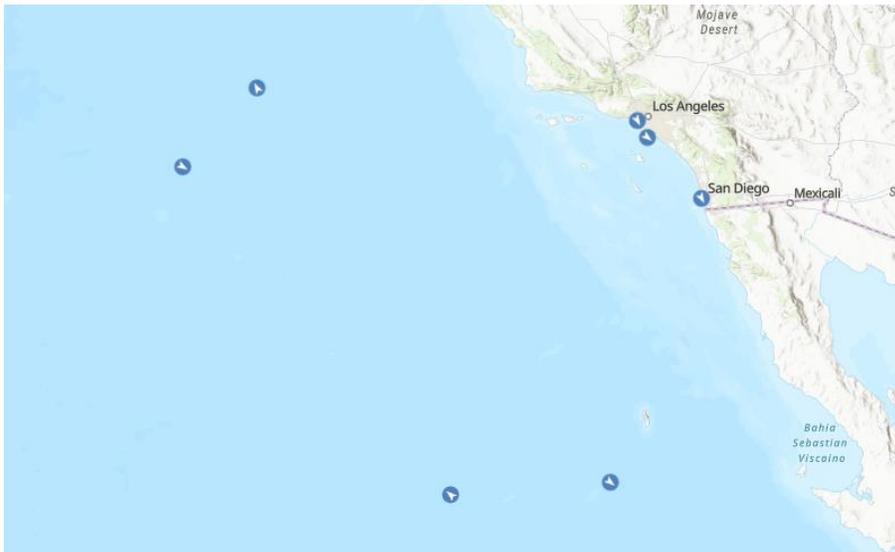
Exercise 3: Create a feature service output

As mentioned previously, stream services do not persist, or store, data in a geodatabase. Your use cases may require you to store and archive historical real-time data in a geodatabase. Output connectors are available in GeoEvent Server that allow you to add or update features in a feature service, that event data is stored in a relational geodatabase.

You will create a new output connector and publish a feature service to store the event data. To complete this exercise, your registered server connection must be a managed relational geodatabase.

1. In **GeoEvent Manager**, on the **Manager** page, click **Add Output**.

2. Under the **Feature Service** category, choose the **Add a Feature** output and specify the parameters as follows:

    a. For **Name**, type `vessels-fs-out`.

    b. For **Registered server connection**, select **Default**.

    c. (In GeoEvent Server 11.0 and later) For **Reference to Layer Type**, select **Browse to Layer**.

    d. For **Folder**, select **Root**.

    e. For **Service Name**, click **Publish Feature Service**.

    > ***NOTE:*** *If the button is grayed out, see Prerequisite 3 above. The ArcGIS Server machine that GeoEvent Server is installed on must have a GIS Server license role applied, a managed relational data store or spatiotemporal data store must be registered with the ArcGIS Server, and the user account provided with the registered server connection must have permissions to publish map and feature services. For more on licensing roles, see [ArcGIS Server licensing roles](). For more information on managed databases, see [Register an ArcGIS Server managed database]().*

        i. For **Name**, type `vessels_tracks`.

        ii. For **GeoEvent Definition**, select **vessels**.

        iii. Click **Publish**.

    f. For **Service Name**, ensure **vessels_tracks** is selected.

    g. For **Layer**, ensure **vessels_tracks** is selected.

    h. For **Update Interval (seconds)**, leave the default value at **1**.

3. Click **Save**.

4. Click ▶ to start the **vessels-fs-out** output.

5. Navigate to the **Manager** page and open the **vessels** GeoEvent Service.

6. Under **Outputs**, double-click **vessels-fs-out** to add it to the service designer.

7. Configure the GeoEvent Service as illustrated below:
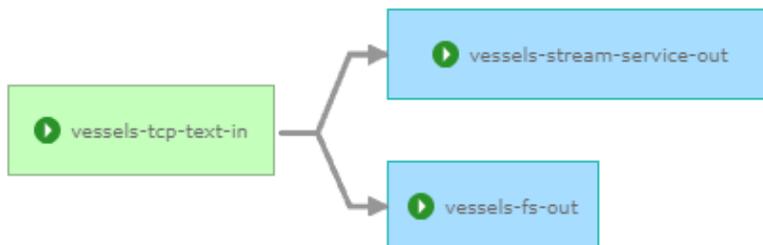
8. Click **Publish** to publish the GeoEvent Service.

Unlike stream services, updating feature services require you set a refresh interval to update features in a web map. This applies to both the ArcGIS Online Map Viewer and the ArcGIS Enterprise portal Map Viewer Classic. For more information, see Set refresh interval (Map Viewer).

Optionally, you can follow similar steps to those in Exercise 2 above to use GeoEvent Server to update features in a feature service, instead of adding features. In summary, you would add a Update a Feature output and publish a new feature service, add the output to the GeoEvent Service, and then add the layer to a web map to view the features being updated.

Note that in this lesson, you published a new feature service using GeoEvent Manager. Alternatively, you can use an existing feature service that is available in your organization, as long as you have a GeoEvent Definition that matches the feature service's schema.

Lesson clean-up

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

- Stop the **vessels** GeoEvent Service to prevent the feature service you published from accumulating too many records.
- Reset your GeoEvent Server configuration in **GeoEvent Manager** by navigating to **Site** > **Configuration Store** and click **Reset Configuration**.
- Delete the **vessels-stream** stream service.

Summary

By completing the exercises in this lesson, you learned how to use GeoEvent Server to make features come alive. You imported a GeoEvent Server configuration, simulated incoming AIS vessel data using GeoEvent Simulator, published a stream service, added the stream service to a web map, and symbolized the vessels based on their current heading.

In Lesson 3, you will work through exercises that introduce how filters can be incorporated into GeoEvent Services. Filters can filter event data based on attribute values as well as identify an event records spatial proximity to an area of interest such as a geofence.