Tutorial

Developing a Weather Monitor Service using GeoEvent Processor

A MGIS Capstone Project

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Introduction & Overview

This tutorial has been developed to provide an overview on how to prepare, consume, and export live data using ArcGIS GeoEvent Processor. The tutorial will guide the user through steps for developing a GeoEvent Service for monitoring severe weather events as a means for improving health and safety.

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Configuring your mobile GPS

The Weather Monitor Service is designed to work with worker location events. While there are many methods for extracting coordinate information from mobile devices, this tutorial will focus on using Android devices and a free application (App), GPS Logger, which can be downloaded from the Google Play Store.
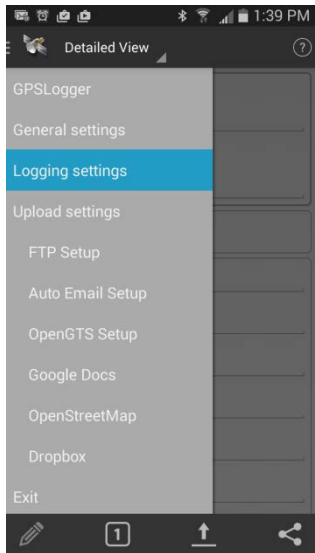
Follow the steps below to download and configure GPS Logger for Android.

1. On your Android mobile device open the Google Play Store.
2. Search for "GPS Logger" and install on your device.
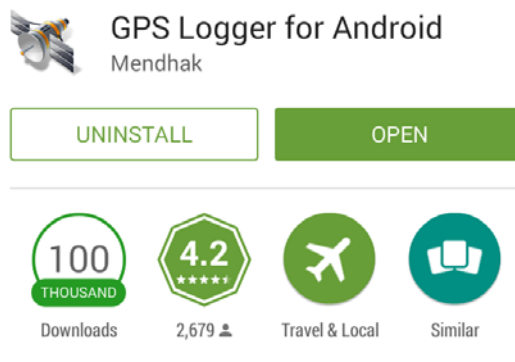
3. After GPS Logger has installed, open the App, navigate to the Settings dialog menu, and select the Logging settings.

4. From the Logging settings menu scroll down to find the Custom file name option and select it.
5. Amend the custom file name to include the worker name, device serial number, year, month, day, hour and minute. The custom file name will serve as the unique ID for each .CSV file generated. This will allow GeoEvent Processor to recognize each .CSV file. The worker name will also be appended to the attributes of the .CSV. The append process is described under the "Convert Text to CSV" section in this tutorial. When finished select "OK" to save.
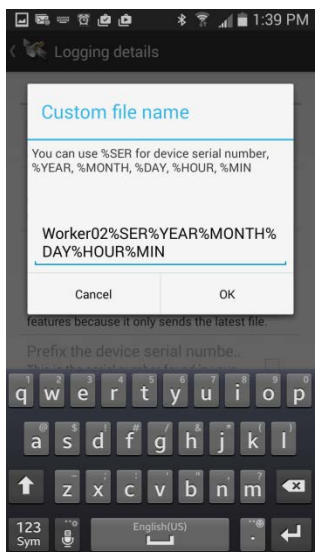
6. Navigate back to the Settings dialog menu and select Upload settings.
7. Ensure that the "Allow auto sending" feature is turned on.
8. Under "How often?" set the log frequency to 5 and select "OK"
9. Scroll down and under AUTO SEND TARGETS select Dropbox for the target location for the .CSV file. *NOTE: When developing your own application you can use any or all of the target locations GPS Logger offers, however this tutorial has been designed to work with Dropbox.* Follow the prompts to set-up Dropbox.
10. Congratulations! Your device has now been configured and is ready to send GeoEvent data.

Setting up the Feature Services

The Weather Monitor Service is designed to work with several Feature Services. The tutorial download includes a map package file (.mpk) that contains the following contents.

- Map Document – *WeatherMonitor_DEMO.mxd*
- Two file geodatabases
  - Featureserver.gdb – contains the *Alerts, Workers,* and *GeoFences* Feature Classes.
  - Featureserver1.gdb – contains the *Tornado Warnings, Severe Thunderstorm Warnings*, and *NWS Public Alerts* Feature Classes.

The .mpk is located under **Data>Weather Monitor Services** folder.

All of the Feature Classes need to be published to an ArcGIS Server as Feature Services. The tutorial assumes that the user has access to ArcGIS Server either through the localhost The ArcGIS Server containing the Feature Services must be registered with the Data Stores. The Data Stores can be found in the GeoEvent Processor Manager under **Site > GeoEvent Processor > Data Stores**
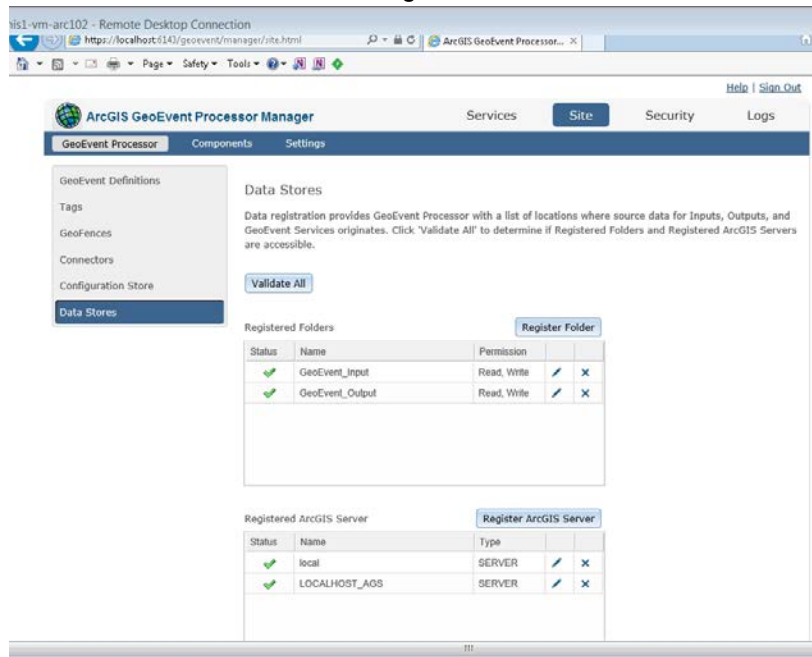

Configuring the Python Code

The Weather Monitor Service utilizes several Python scripts. You will need to configure the scripts to run properly on your machine. All scripts are located in **Data>Scripts** folder included with this tutorial.
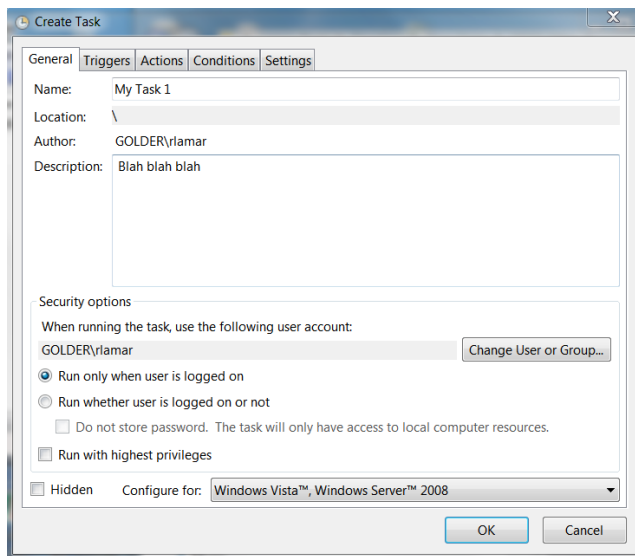
Set a Task

All scripts will need to be run at 5 minute intervals to ensure that GeoEvent Processor is receiving the most up-to-date information. To schedule a task do the following

1. From Windows open **Task Scheduler**

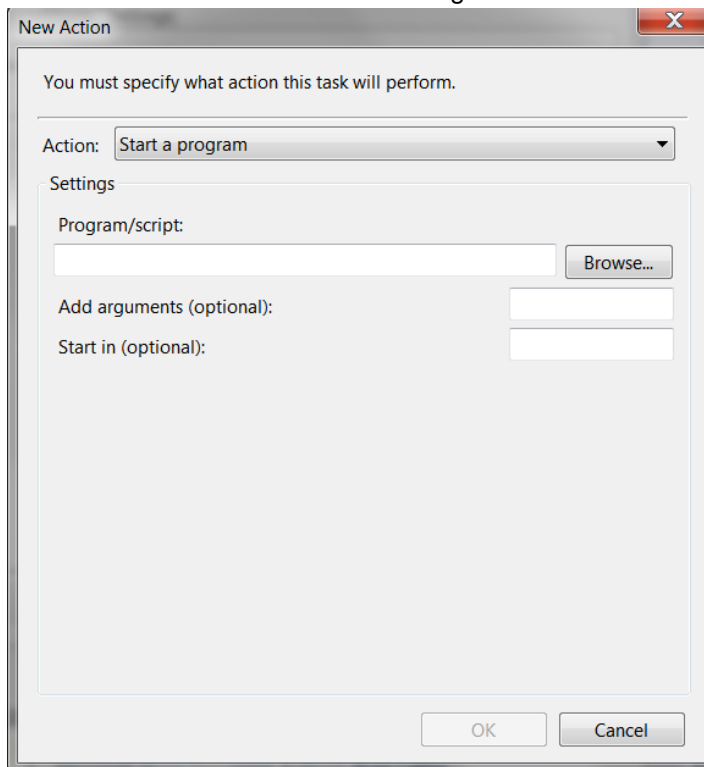2. Create a new task **Action>Create Task**
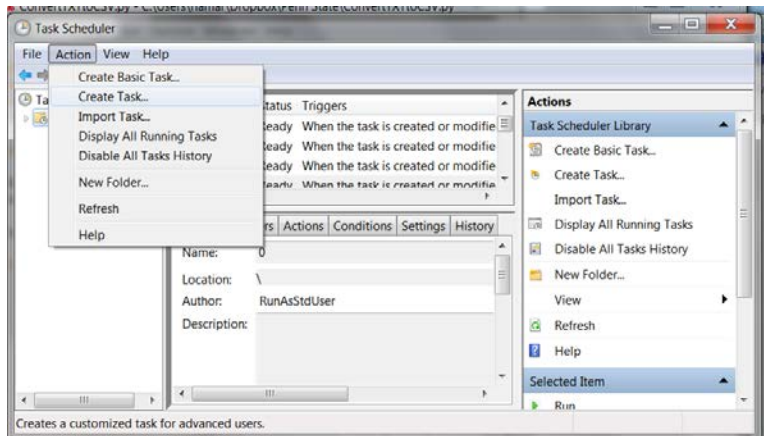
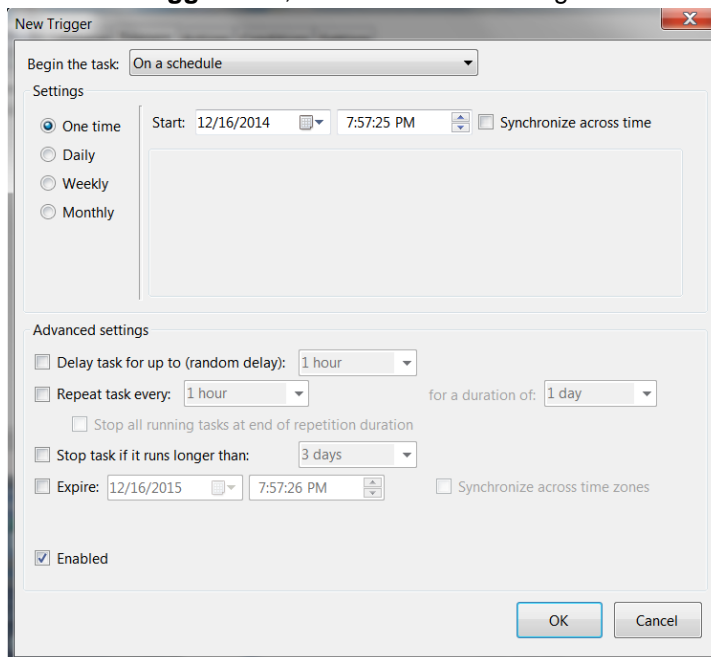3. Give the task a **Name** and select the **Actions** tab.

4. Under the **Actions** tab select **New**

5. Define the New **Action** as Start a Program

6. Browse for the Python script file you want to run. Hit **OK** to exit.
7. Select the **Triggers** tab, and set the task to begin **On a schedule**

8. Under settings select **One time** and set the start to the current date and time
9. Under Advanced settings select **Repeat** task every 5 minutes
10. Ensure the **Enabled** box is checked.
11. Hit **OK** to save and exit

Convert Text to .CSV

The GeoEvent data sent from GPS Logger will be recognized as a .txt file. The script "ConvertTXTtoCSV.py" will locate the input .txt file, append the worker ID name from the file name to an attribute record, remove the column header names, convert the .txt file to a .CSV, save the .CSV to the registered GeoEvent Processor Input folder, and then delete the .txt file to save disk space.

To configure the ConvertTXTtoCSV.py follow these steps.

1. Create the following folder directory on your local machine **C:\GeoEvent\Input**. The Input folder will be recognized as a registered folder in the GeoEvent Processor Manager Data Stores when you import the configuration file later in the tutorial.
2. Locate the Scripts folder included with this tutorial **…\Data\Scripts**
3. Open the ConvertTXTtoCSV.py with a Python editor such as IDLE.
4. Update the directory path with the path to the folder containing the input GPS files from the mobile device (e.g. C:\Users\yourname\Dropbox\Apps\GPSLogger for Android) and save.
5. Follow the instructions under "Set a Task" to automatically run the script.
6. Congratulations! You've now configured the Input file for GeoEvent Processor.

Get .JSON

A series of Python scripts are used to routinely check external weather web services (e.g. NOAA, NWS) for updates and generate a .JSON file.

- json_NOAA_SVR_ShortTermWarnings.py (Severe Thunderstorm Warnings)
- json_NOAA_TOR_ShortTermWarnings.py (Tornado Warnings)
- json_NWS_Public_Alerts.py (National Weather Service Public Alerts)

The scripts send a .JSON query to the external weather web service(s) and return an updated .JSON file to a subfolder, **NOAA_Warnings**, of the Input folder created above. The URL to the external service and the logic for the .JSON queries are hardcoded into the Python code for each Python script.

To configure the Get .JSON scripts follow these steps.

1. Create the subfolder **NOAA_Warnings** under **C:\GeoEvent\Input**
2. Schedule a task for each of the three scripts following the instructions under the section Set a Task.
3. Congratulations! You've now configured the code required to monitor external weather services for updates.

Convert .JSON to Shapefile and Update ArcGIS Feature Services

The .JSON files created above contain the data required to generate the GeoFences used by the Weather Monitor Service. The following series of scripts convert the .JSON file to a shapefile, and update the corresponding Feature Service on the registered ArcGIS Server.

- NOAA_SVR_ShortTermWarnings_json_to_FC.py (Severe Thunderstorm Warnings)
- NOAA_TOR_ShortTermWarnings_json_to_FC.py (Tornado Warnings)
- NWS_Public_Alerts_json_to_FC.py (National Weather Service Public Alerts)

Follow the steps below to configure each of the Convert .JSON to Shapefile scripts.

1. Open the script(s) with a Python editor such as IDLE

2. Under the **Local Variables** update variables **SDE_1** and **SDE_2** with the file path to the local registered ArcGIS Server
3. Schedule a task for each of the three scripts following the instructions under the section Set a Task.
4. Congratulations! You've now configured the code required to routinely update the GeoFences in GeoEvent Processor.

Configuring GeoEvent Processor

To help you get started a GeoEvent Processor configuration file has been included as part of this tutorial download. Importing the configuration file will create the items listed below – if items of the same name already exist in your GeoEvent Processor Manager, importing the product configuration will update them and overwrite any changes you may have made in previous tutorials.

Weather Monitor DEMO– GeoEvent Processor Quick Start Configuration contents:

- Required GeoEvent Definitions
- Required Tags
- Required Data Stores
- Required GeoFences – *Project Boundary, Severe Thunderstorm Warnings, NWS Public Alerts, and Tornado Warnings*
- Required Input connectors – *file-csv-in*
- Required Output connectors – *email-text-out-NWS-Public-Alerts, email-text-out-SevereThunderstormWarnings, email-text-out-TornadoWarnings, email-text-out-Worker-Arrival, email-text-out-Worker-Departure, worker-alerts-out-DEMO, and worker-location-out-DEMO.*
- Preconfigured GeoEvent Service – *Weather-Monitor-Service-DEMO*

Follow the steps below to import the GeoEvent Processor configuration file.

1. Open **GeoEvent Processor Manager** at https://localhost:6143/geoevent/manager/
2. In **GeoEvent Processor Manager,** navigate to **Site>GeoEvent Processor>Configuration Store**.
3. Click **Import Configuration** and browse to **Weather-Monitor-Service-DEMO.xml** file located in the **Configurations** folder included with this tutorial.
4. Select the **Weather-Monitor-Service-DEMO.xml** file and click **Import** to import the configuration.
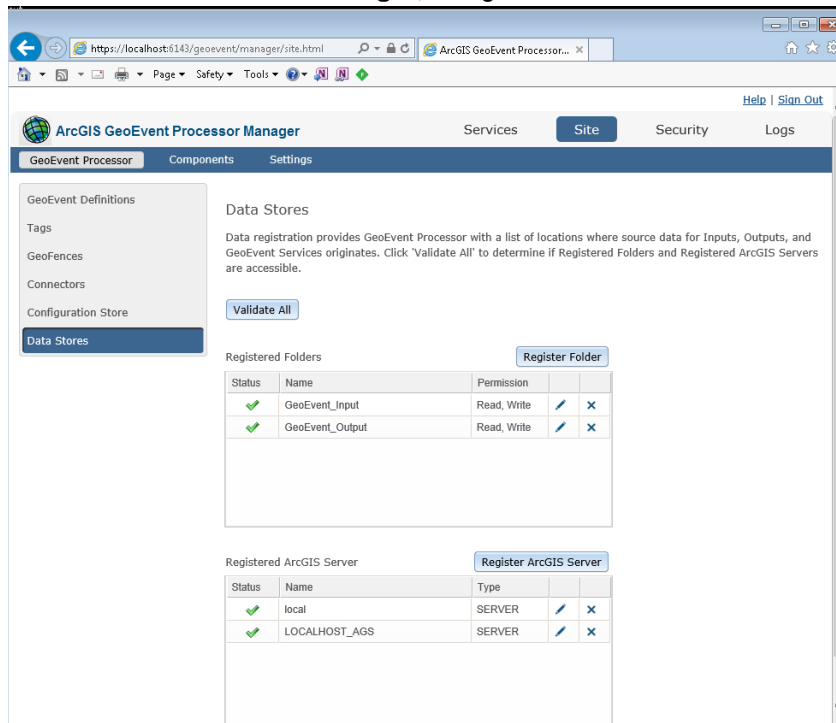
Building the Weather Monitor Service

With the configuration file imported you will now configure the Weather Monitor Service through the GeoEvent Processor Manager.

Register Folders and ArcGIS Server

Update the Registered Folders and Registered ArcGIS Server locations.

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

2. Under the **Registered Folders** section Register the **Input** folder created in the previous steps.

3. Register your local ArcGIS Server under **Registered ArcGIS Server**

4. Congratulations! You've now registered your local ArcGIS Server and Input folder.

Synchronize your GeoFences

1. In **GeoEvent Processor Manager,** navigate to **Site>GeoEventProcessor>GeoFences**
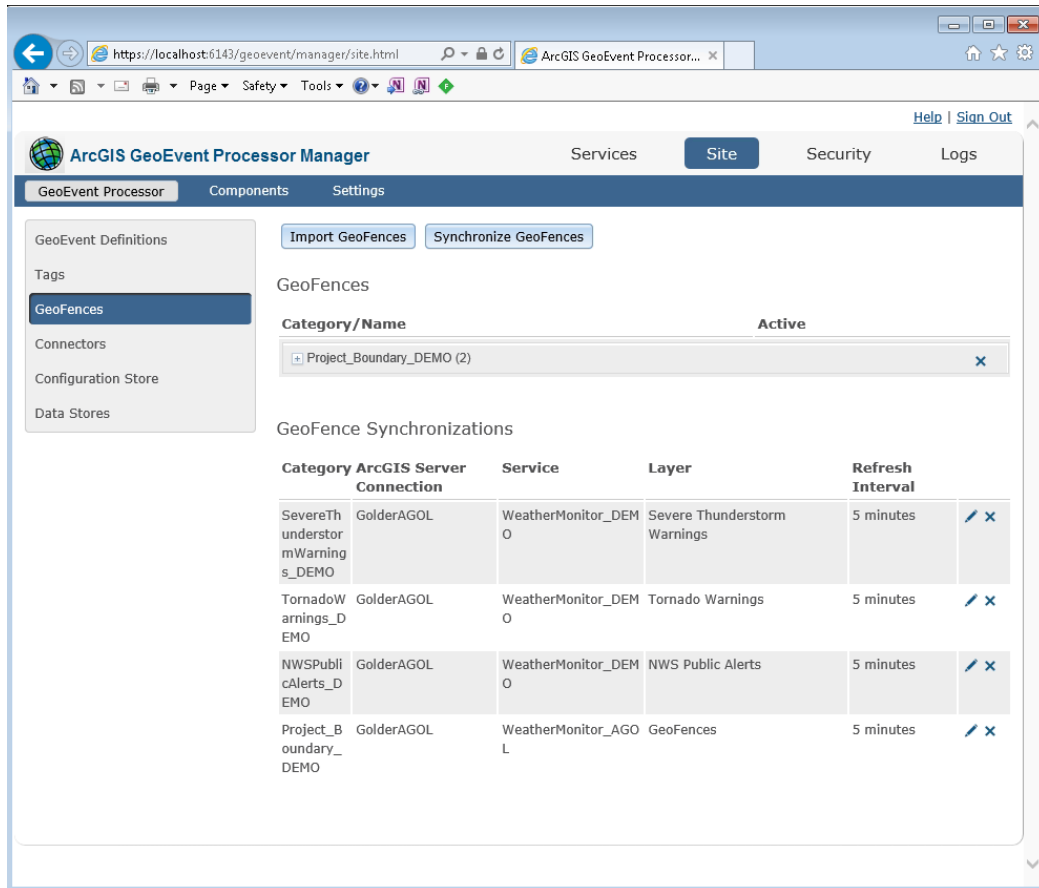
2. Select the **Synchronize GeoFences**

3. Fill in each field as shown above.

4. Repeat step b 3 times, once for each Weather GeoFence. NOTE: It is important that for each GeoFence the **Name Field** is set to ObjectId. The **Name Filed** will be used to name each imported GeoFence and must be unique for each GeoFence to be imported properly.
   a. Severe Thunderstorm Warnings
   b. Tornado Warnings
   c. NWS Public Alerts
5. The last GeoFence to be added will be for the Project Boundary. The Feature Service "GeoFences" contains the Project Boundaries.
   a. Locate the "GeoFences" Feature Service and select it as the **Layer**
   b. Set the **Category Field** to category
   c. Set the **Name Field** to name
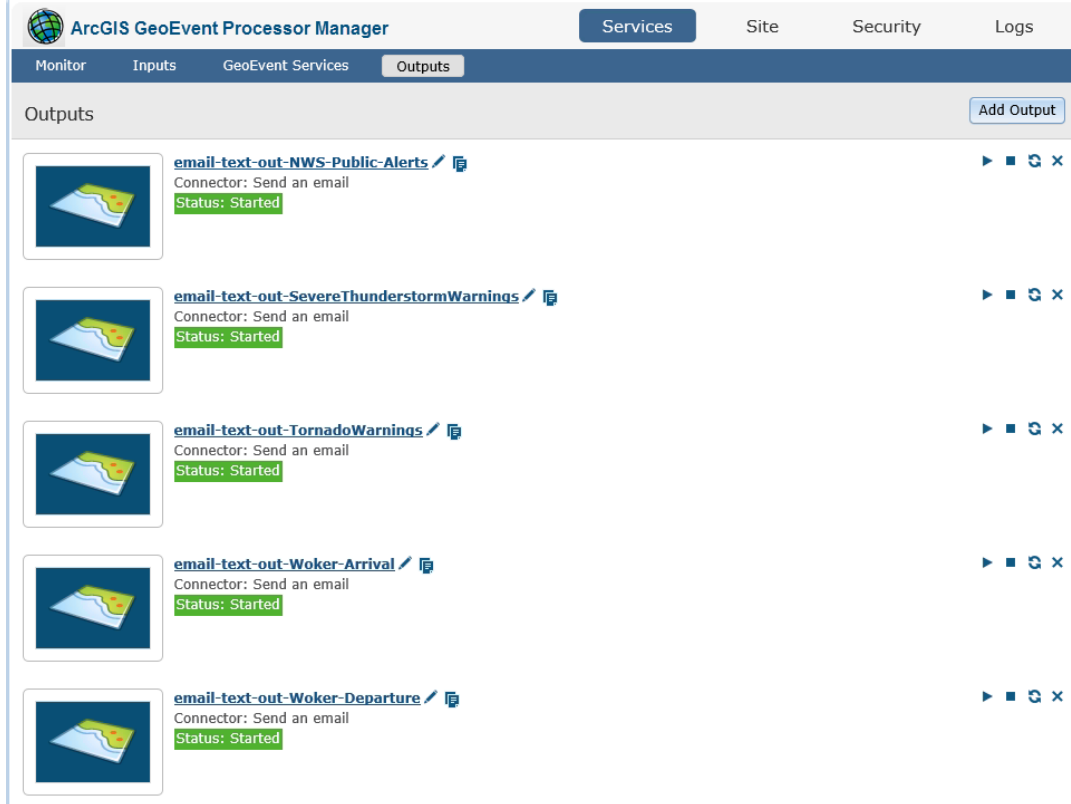
6. Congratulations! You've now configured your Data Stores and GeoFences

Configure the Outputs

The function properly with your data the Outputs will need to be updated.

Update email Outputs

1. In **GeoEvent Processor Manager,** navigate to **Services>Outputs**

2. Select **email-text-out-NWS-Public-Alerts**

3. Fill in the **Sender's email address**, **Email Recipients** address(s) and the items under the Advanced tab.
4. Repeat steps 1 – 3 to configure the email outputs for Severe Thunderstorm Warnings, Tornado Warnings, Worker Arrival, and Worker Departure.
5. For more information on working with email outputs you can access the GeoEvent Processor tutorial *Notifications in GeoEvent (ArcGIS 10.2.x)* which can be found here http://www.arcgis.com/home/item.html?id=d746e50bdeba442ba36f8606f185a670

Update a Feature
1. In **GeoEvent Processor Manager,** navigate to **Services>Outputs**

2. Select **worker-alerts-out-DEMO**

3. Update the fields using the dropdown boxes to ensure that the Output is pointing to the correct Feature Service on your ArcGIS Server
4. Repeat steps 1 – 3 to update the **worker-location-out-DEMO** Output
5.

Review and Monitor the GeoEvent Service

Now that the service has been configured you can review the GeoEvent Service model and publish it. Once it's published the service is live and should start receiving data and generating outputs.

Review the GeoEvent Service

1. In **GeoEvent Processor Manager,** navigate to **Services>GeoEvent Services**
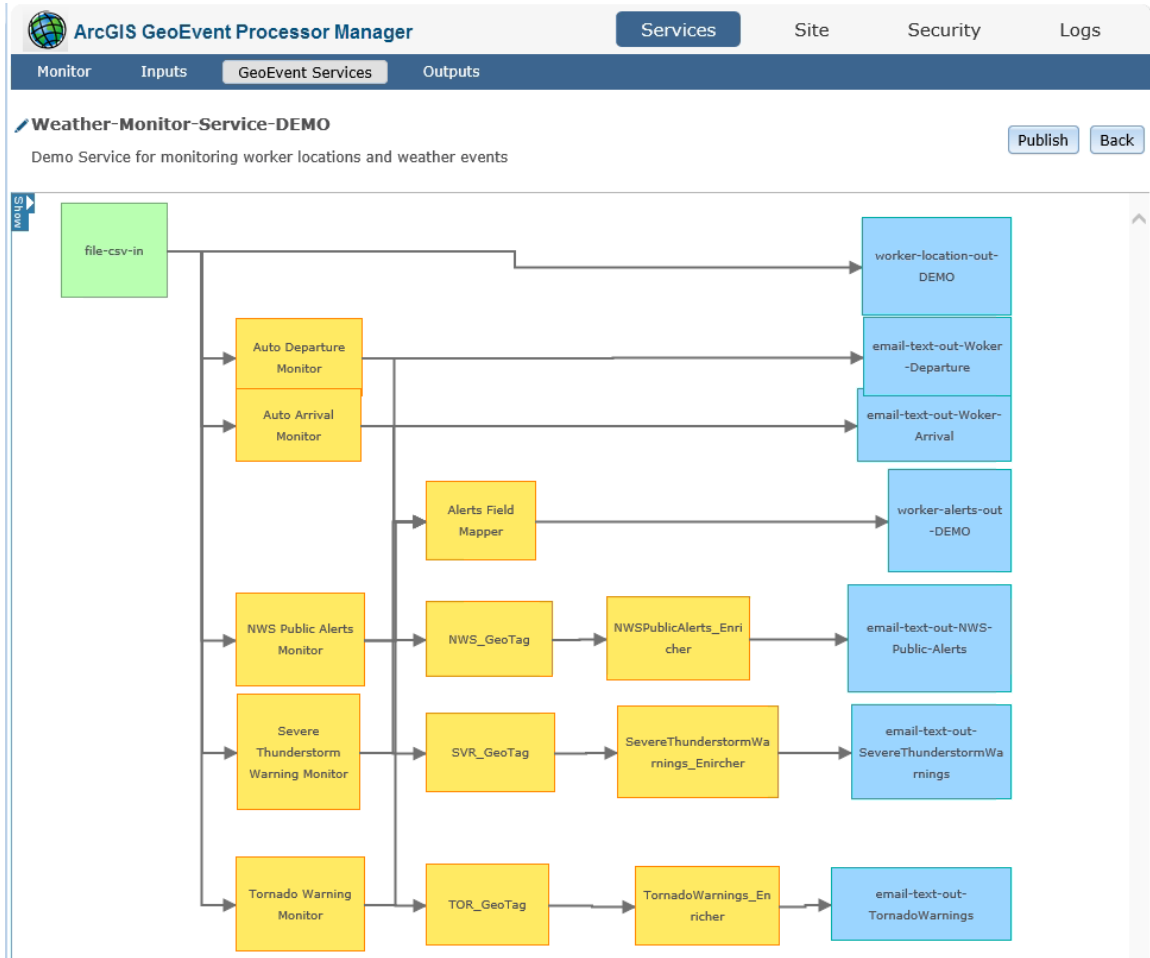
The **GeoEvent Services** page displays a model view of the Service you've created. The green items are the Inputs, the yellow items are the Processors developed for this Service, and the items in blue are the Outputs.

Monitor the GeoEvent Service

1. In **GeoEvent Processor Manager,** navigate to **Services>Monitor**

The **Monitor** page displays metrics about the events that are handled by each of the inputs, outputs, and GeoEvent Services that have been configured. You can use this page to review the status of your services, inputs, and outputs, and monitor how active your services are.

Wrap Up

Congratulations! By completing this tutorial you've learned how to use GeoEvent Processor to consume live data streams, process the data streams, and generate outputs of the results. Please feel free to improve upon the current processes described above and share those improvements with others.

To learn more about GeoEvent Processor or get more help regarding any of the processes described above please refer to the ArcGIS GeoEvent Processor Gallery