AUGUST 23, 2022



GEOMERGE 2.2
USER GUIDE



Table of Contents

What is GeoMerge?	. 2
Purpose	. 2
Capabilities	. 2
Supported Data Types and Items	. 3
System Hardware, Software, and Licensing Requirements	. 4
ArcGIS Pro 3	. 4
Installation	. 5
GeoMerge Tool Installation	. 5
GeoMerge Add-In Installation	. 5
GeoMerge Configuration Sample Scenario	. 5
Create a Project	. 5
Settings	. 6
Open GeoMerge	. 8
Create a New Project	. 8
Save a Project	. 8
Project Configuration	. 9
Task Scheduler	19
Querying the Log SQLite Database	21



Overview

What is GeoMerge?

Purpose

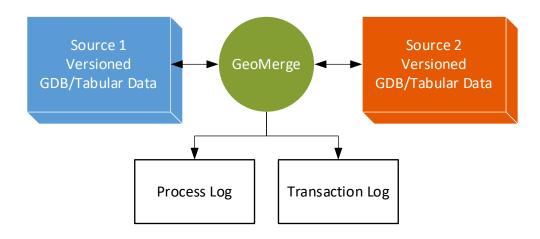
This document is intended for users that will synchronize data using the GeoMerge Add-In for ArcGIS Pro. The primary purpose of this document is to get the user acquainted with the GeoMerge Add-In configuration files and ways for launching data synchronization.

Capabilities

GeoMerge is a tool used to programmatically synchronize two layers/tables in two separate Geodatabases or regular tabular databases with each other. And now, GeoMerge is available as an ArcGIS Pro Add-In. GeoMerge leverages ArcGIS Pro to organize your work into projects that include the maps, item connections, and datasets that will serve as the inputs for GeoMerge. The standard inputs into a GeoMerge project could look like the following:

- <u>Data Source 1</u>: GeoDatabase/Database A containing layer/table A.
- <u>Data Source 2</u>: GeoDatabase/Database B containing layer/table B.
- Set of Conflict resolution rules
- Pre-synchronization and post-synchronization commands

Given the above, GeoMerge compares and merges (or synchronizes) the data in layer/table A and B in the two data sources. GeoMerge processes the data according to the defined rules. Depending on the rules, the layers/tables a and b may have the identical data, or they may not. Synchronization implies that changes can occur in either A or B or in both.





Supported Data Types and Items

GeoMerge and the GeoMerge Add-In for ArcGIS Pro are compatible with various data types.

		Source								
		File GDB	Esri Feature Service (w/ branch versioning)	Utility Network*	Geometric Network	SQL Server Enterprise GDB**	SQL Server Table***	Oracle GDB	Oracle Table	Mobile Geodatabase
Destination	File GDB	х	х	х	х	х	х	х	х	Х
	Esri Feature Service (w/ branch versioning)	х	х	х	х	х	х	х	х	Х
	Utility Network*	х	х	х	х	х	х	х	х	Х
	Geometric Network									
nation	SQL Server Enterprise GDB**	х	х	х	х	х	х	х	х	Х
	SQL Server Table***	х	х	х	х	х	х	х	х	Х
	Oracle GDB	х	х	х	х	х	х	х	х	Х
	Oracle Table	х	х	х	х	х	х	х	х	Х
	Mobile Geodatabase	х	х	х	х	х	х	х	х	х

^{*} Esri feature service with branch versioning.

^{**}Supports traditional versioning.

^{***}SQL Server / Oracle table supported through OLE DB connection type.



System Hardware, Software, and Licensing Requirements

ArcGIS Pro 3

GeoMerge configurations, including batch job schedules, are now edited and accessed through your ArcGIS Pro projects. System and software <u>requirements for ArcGIS Pro 3</u> are presented by Esri. For best performance with ArcGIS Pro and large GeoMerge projects, SpatialWave recommends exceeding Esri's minimum requirements.

Esri has <u>technology checks</u> available through the System Requirements Lab. This application performs an automatic diagnostic check of your computer. It will provide a report on the system's ability to run ArcGIS Pro 3 by indicating if it meets the minimum (or recommended) system hardware requirements.

Licensing

An ArcGIS Pro Standard or Advanced license is required to use the GeoMerge Add-In. Esri offers the following license types for ArcGIS Pro:

- Named user (default)
- Single Use (available when ArcGIS Pro is part of ArcGIS Desktop)
- Concurrent Use (available when ArcGIS Pro is part of ArcGIS Desktop)

SpatialWave recommends a Single Use license when using the GeoMerge Add-In with Windows Task Scheduler functionality. This will ensure a license is available for GeoMerge to use when an automated task is triggered. Other licensing methods like Named User will work. However, it is not uncommon for stored named user credentials to "go missing" if that Esri Named User is being used across multiple devices and applications. Additional information on Esri <u>licensing for ArcGIS Pro</u> is available from Esri.

The requirement for Esri Extension licenses such as Utility Network or Parcel Fabric may be needed when using GeoMerge with datasets requiring these licensed extensions.



Getting Started

Installation

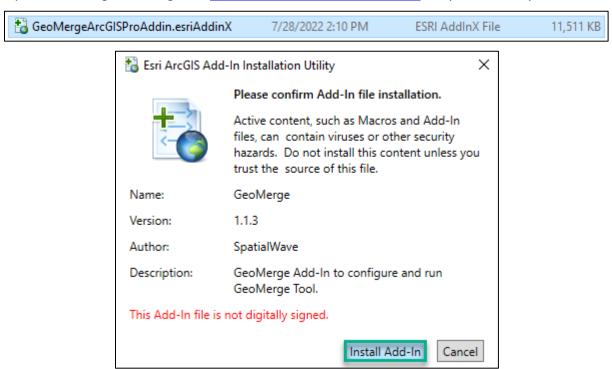
GeoMerge Tool Installation

Extract the GeoMergeTool_2.X.zip and place the folder where you would like the GeoMerge tool to be saved. Using Windows Explorer, the GeoMerge Tool folder must be unzipped and placed in the appropriate folder space. SpatialWave recommends the C drive or ArcGIS Pro Project folder.

GeoMerge Add-In Installation

Before installing the latest version of the GeoMerge Add-in, remove any previously installed versions.

Steps for deleting, installing, and managing add-ins for ArcGIS Pro are presented by Esri.



GeoMerge Configuration Sample Scenario

Create a Project

Creating ArcGIS Pro project is the first step when configuring the foundation of your GeoMerge project. An existing ArcGIS Pro project is an excellent place to start. The GeoMerge Add-In for ArcGIS Pro requires that the project be configured with maps containing GIS layers, tables, and

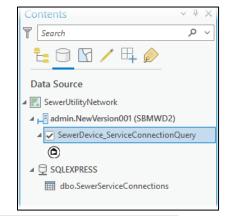


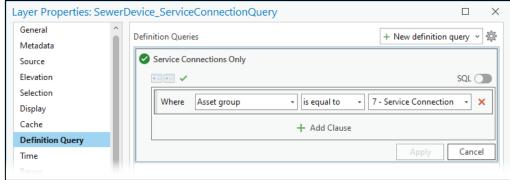
dataset connections. These datasets must be visible in the Contents panel of ArcGIS Pro to be

used in GeoMerge. Further information on <u>getting started</u> with <u>ArcGIS Pro projects</u> is available from Esri.

Note: The screenshots in this document depict a project configured to take attribute data from a SQL table and overwrite the corresponding attributes of an Esri Feature Service that contains a Utility Network.

The GIS layer in this project is an Esri Feature Service and a branch version. The layer is a SewerDevice feature from a Sewer Utility Network dataset. A definition query has been applied to only display service connection asset groups.





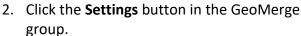
A stand-alone SQL table containing sewer service connection attribute data has been added to the Contents panel using an OLE DB connection type. The SewerServiceConnections SQL table will be used to overwrite the corresponding attributes in the SewerDevice ServiceConnectionQuery layer.

Add-In

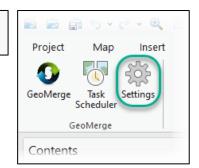
Settings

The settings for the GeoMerge Add-In are accessed through the ribbon in ArcGIS Pro.

 Click the Add-In tab on the ArcGIS Pro ribbon at the screen's top.

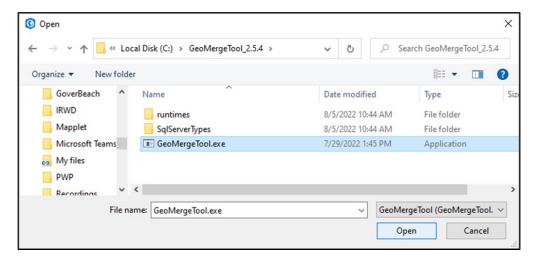


Note: The first time the GeoMerge Add-In is used on any desktop machine, the user will be prompted to indicate the location of the GeoMerge tool executable (.exe). This executable is in the GeoMergeTool_2.X folder saved to the local desktop machine



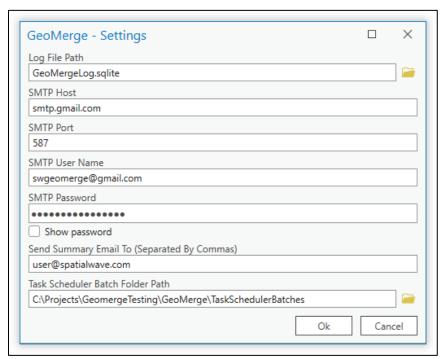
during the tool Installation section of this document. The GeoMergeTool_2.X folder is typically saved to the C drive or ArcGIS Pro project folder.





The following setting parameters are available to configure:

- Log File Path GeoMerge saves logs in an SQLite database. This parameter specifies the folder path for GeoMerge to save the log.
- **SMTP Host** Host SMTP service that will email results of GeoMerge batch automation.
- **SMTP Port** SMTP port to be used.
- SMTP Username Email address that will email results of GeoMerge batch automation.
- SMTP Password (and Show password) Email password.
- Send Summary Email To Individual email addresses to receive GeoMerge batch automation reports—separate email addresses by a comma "," to email reports to multiple recipients.
- Task Scheduler Batch Folder Path Destination folder for GeoMerge automation batch files.



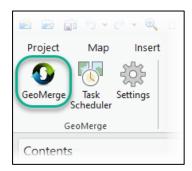


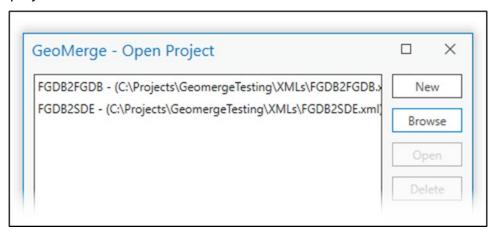
Open GeoMerge

To open GeoMerge inside of ArcGIS Pro:

- 1. Click the **Add-In** tab on the ArcGIS Pro ribbon at the screen's top.
- 2. Click the **GeoMerge** button in the GeoMerge group.

The GeoMerge Open Project window appears. From this window, users can create **new** projects, **browse** and import GeoMerge XMLs from previous projects, **open** existing projects, and **delete** projects.





Create a New Project

GeoMerge configuration files have a project name that can be specified at the top of GeoMerge Graphic User Interface (GUI). This name is used as an identifier of the project.

For this scenario, we will create a new GeoMerge project.

1. Click New.

The GeoMerge project window appears.

2. Under the **Project** parameter, enter the name for this GeoMerge project.



Save a Project

1. After entering a name for the project, click **Save**.



2. Please enter a name for the XML file and save it in your chosen location.

A message will inform the user that the GeoMerge project was saved.

Note: The user will also be prompted to save the GeoMerge project manually by running the GeoMerge project from the GeoMerge GUI.

Project Configuration

Additional configuration information is displayed in three (3) sections that users need to fill in GeoMerge GUI for any GeoMerge configuration file:

- Data Sources
- Rules
- Pre/Post Events

Datasources and Rules information is mandatory for starting data synchronization. Pre/Post Events and Task Scheduler are optional and can be empty.

Note: Task Scheduler for GeoMerge is now accessed through the Add-In tab on the ribbon at the top of the ArcGIS Pro interface.

Data Sources Tab

Layer A and Layer B

There are three (3) tabs across the top of the GeoMerge window: Data sources, Rules, and Pre/Post Events. Starting with the **Data sources** tab:

1. Enter Layer A by input by clicking the dropdown button ☐ and select the table using the GeoMerge – Select Layer window.

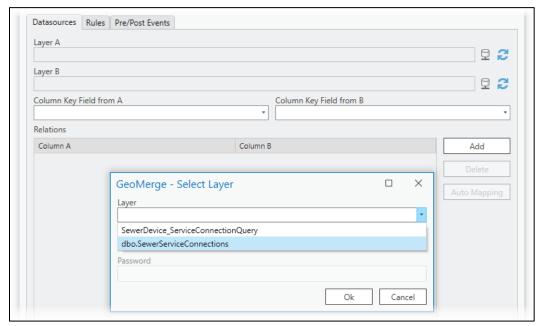
GeoMerge

Task

Scheduler

GeoMerge

2. Enter a **Username** and **Password** if required and click **Ok**.





3. Repeat this process for Layer B.

In this scenario, Layer A is the stand-alone SQL table, and Layer B is a Utility Network layer. Database admin credentials were used when adding the SQL table to Layer A. ArcGIS Enterprise named user credentials with a Utility Network license were entered for the username and password for Layer B.

Click Ok and Save your work as you go.

Suppose datasets specified as Layer A or Layer B are altered or list of fields are changes for any reason. In that case, a refresh and resynchronizing of the data between the GeoMerge configuration and ArcGIS Pro Project is required. Press the refresh buttons to refresh the list of columns for Layer A and Layer B.



Column Key Fields

After Layer A and Layer B is filled, the column key fields from Layer A and B must be filled to associate the individual records between datasets. Key fields should be indexed for best performance.

1. Use the dropdown from **Column Key Field from A** and **Column Key Field from B** to associate linking fields between Layer A and Layer B.



In this scenario, the Utility Network field ASSETID was used to associate individual records between Layer A and B.

Relations

The Relations matrix of the Data Sources tab is used to map the associated fields between datasets.

1. Use the **Auto Mapping** button to have GeoMerge attempt to automatically map the fields between Layer A and Layer B.

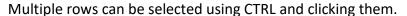


Tables and layers with the same field names from Layer A and Layer B will be added to the matrix of relations. Fields that cannot be matched will be added to the matrix without an associated match on the other side of the matrix.

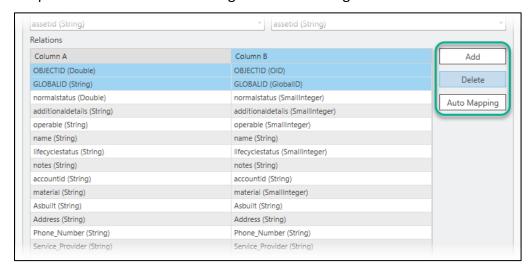
2. Use the **Add** button to map fields individually.

Adjust and make changes if needed by clicking the cell of the field in the matrix to expose the dropdown to present the available choices.

3. Remove unmatched or read-only fields using the **Delete** button.







After using the Auto Mapping button, remove any fields that cannot be matched. This could include fields that are not present in both datasets. Additionally, Esri OBJECTID and GLOBALID fields can only be mapped from the source dataset and written to the destination dataset as a string or number field type.

4. **Save** your work as you go.

Rules Tab

The Rules tab is where the synchronization rules are configured for GeoMerge projects. Rules tab contains the following sub-tabs: In A (Layer A ID), In B (Layer B ID), and In Both.

1. Click the **Rules** tab to access configuration options for rules.



Configure rules for all necessary types of conflicts.

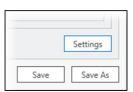
- In A (record is present in Layer A but does not exist in Layer B),
- In B (record is present in Layer B, but does not exist in Layer A), and



In Both (the record is present in Layers A and B).

Settings

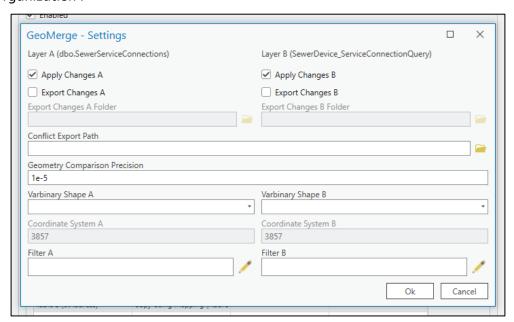
Specify general synchronization parameters on the **Settings** form that can be opened by pressing the **Settings** button in the bottom-right corner of the Rules tab.



The following parameters are available from the Settings form.

- Apply Changes A/B specifies if changes should be applied to the corresponding layers
- Export Changes A/B specifies if transaction files for layer A/B should be created during data merging. If this option is turned on, a path to locate transaction files must be specified.
- Export Changes A (and B) Folder Specifies where transaction files will be created.
- Conflict Export Path path to the log file where problems during data merging will be written
- Geometry Comparison Precision precision to which geometry data will be compared
- Varbinary Shape A (and B)— varbinary columns that will be projected to the specified coordinate system. Note that projection is not used during data comparison.
- Coordinate System A (and B) Coordinate systems for Layer A and Layer B.
- Filter A (and B) a condition that filters the data in the corresponding layer. The filter expression is automatically populated when using layer Definition Queries in ArcGIS Pro. Information on layer definition queries are presented by Esri.

 Example: Specify conditions to restrict data in layer A/B in "Filter A/B" fields. For example, you want to synchronize Layer A only for the specific owner. Layer A has an "Owner" field. In this case, the value in Filter A should be like this: "Owner = 'Our Organization'."





In A, In B, or Both

When rules are applied to Layer A, the rules apply to all records found in Layer A and not found in Layer B. Only conflicts with checked **Enabled** will be used during data synchronization.



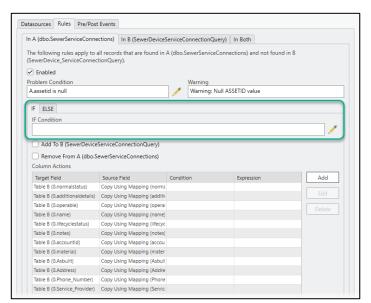
Problem Condition (Optional)

GeoMerge can perform data synchronization in two (2) stages. The problem Condition must be specified for this purpose.



If and Else (Optional)

If users need to add different actions for the same conflict type depending on the data, use IF Condition for this purpose. For example, if you need to add records to Layer B in case the owner is 'Our Organization,' you need to delete the record from Layer A. For such a case, specify IF Condition as "A.Owner='Our Organization'" and configure rules on the IF tab. On the ELSE tab, specify the action for data removal. When the IF Condition is empty, all synchronizing records rules from the IF tab will be applied.



Record Actions and Column Actions — Actions that will be applied to the data and corresponding column actions should be specified at least on the IF tab for each enabled conflict type (In A, In B, In Both). In case IF Condition is specified, the ELSE tab should be filled also. Records Actions are different for different conflict types.

For the In A tab, conflict types have the following actions: Add to B, and Remove from A.





For the In B tab, conflict types have the following actions: Add to A, and Remove from B.



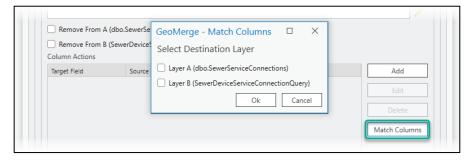
For the In Both tabs, conflict types have the following options.



Column Actions can be specified in two (2) ways.

Automatically - In Both Conflict, press the Match Columns button to copy already mapped on the Data Sources tab columns

Match Columns form will appear:

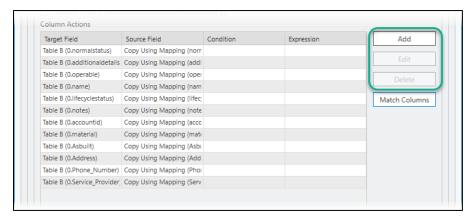


Select the direction of column actions and press the **OK** button.

In A/In B conflicts: check Enable box for the conflict. This will populate Column Actions with the records based on the mapping specified in Relation Editor form on the Data Sources tab.

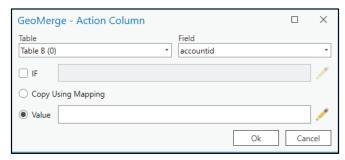
Manually - Use the **Add**, **Edit**, and **Delete** buttons for the column actions configuration in the grid. Action Column form will appear after pressing Add/Edit buttons.





Setting Sequential Values by Launching AssetID DLL

AssetID.DLL is developed for calling from GeoMerge projects during data synchronization. Users can call AssetIdCalculator function from this library for column actions values.



AssetIdCalculator function returns sequential values based on the parameters. Users can pass three (3) parameters to this function:

Name of the column from which last value will be taken. For example, this column has values like 1, 2, 3, ..., 99. Next value that will be generated for this column will be 100.

Text part of the values before sequential part of the column. If column has text value it is possible to have some char prefix before sequential number. For example, the column has values like GW_001, GW_002, GW_003, ..., GW_099. Next value that will be generated for this column will be GW_100. Prefix value that needs to be specified in this parameter will be 'GW_'.

Number of digits in the sequential part of the column. For example, the column has values like GW_0001, GW_0002, GW_0003, ..., GW_0099. Next value that will be generated for this column will be GW_0100. Prefix value that needs to be specified in this parameter will be 'GW_'. The number of digits that must be specified is 4.

Here are some examples of launching AssetID library:

"ExternalCall('C:\Data\GM\DLLS\AssetId.dll','AssetId.AssetIdCalculator', 'B.AssetID', 'PWARLS', 6)"

6 is number of digits in AssetID value. Values like 'PWARLS000123' will be returned.

If the call looks like this:



"ExternalCall('C:\Data\GM\DLLS\AssetId.dll','AssetId.AssetIdCalculator', 'B.AssetID', ", 6)"
Then numbers (strings) like 000001, 000012 will be generated.

If the call is like this:

"ExternalCall('C:\Data\GM\DLLS\AssetId.dll','AssetId.AssetIdCalculator', 'B.AssetID', ", 0)"
Then numbers (integer) like 1, 2 will be generated.



Pre/Post Events Configuration

Pre/Post Sync Events are sets of batch commands to be executed at a specific moment - before or after merging data for a specific layer relation. Some commands that you can write into events are described on the Microsoft site.

For example, you want to open a transaction file with the list of changes to Layer A that GeoMerge generates during the synchronization. In this case, the command that will be executed will be written into Post Successful Sync Event for the layer relation after merging the data of which you want this event to be executed.

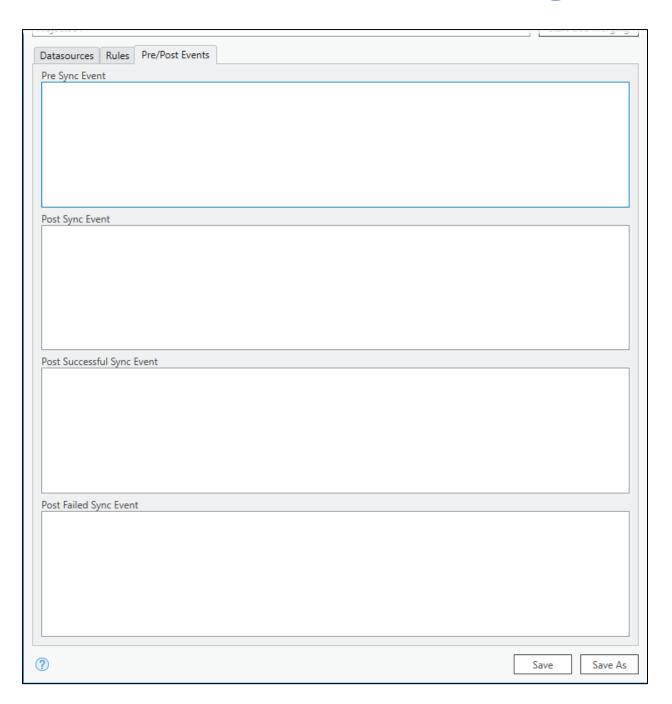
There are four types of events in the GeoMerge project:

- Pre Sync Event the commands from this event will be executed before starting data synchronization for each section (layer relation). When the GeoMerge configuration file has several layer relations to be synchronized, you can specify pre-sync event commands for every layer in the file.
- **Post Sync Event** the commands from this event will be executed after finishing data synchronization for the specified section (layer relation) whether merging process has been successful or failed. When the GeoMerge configuration file has several layer relations to be synchronized, you can specify post-sync event commands for every layer sets in the file.
- Post Successful Sync Event the commands from this event will be executed after Post Sync Event or after finishing data synchronization for the specific section (layer relation) if Post Sync Event is not specified in case if GeoMerge process has been finished without errors. When the GeoMerge configuration file has several layer relations to be synchronized, you can specify post-successful sync event commands for every layer in the file.
- Post Failed Sync Event the commands from this event will be executed after Post Sync Event or after finishing data synchronization in case if Post Sync Event is not specified in case if GeoMerge process has been finished with errors and no data were synchronized. When the GeoMerge configuration file has several layer relations to be synchronized, you can specify post-failed sync event commands for every layer in the file.

To modify Pre/Post Sync Events, follow the next steps:

- 1. Click the **Pre/Post** Event tab.
- 2. Select the layer relation for which you want to configure the event.
- 3. Make all necessary changes to the event(s) you want to change.
- 4. **Save** your work as you go.







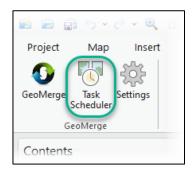
Task Scheduler

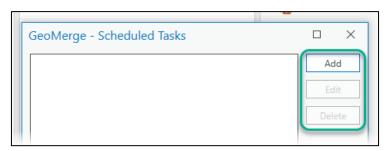
The Task Scheduler allows you to schedule automated tasks that run the GeoMerge tool for the opened configuration at a specific time or when a particular event occurs. It provides an organized view of the tasks and a convenient point of access for managing them. From the Task Scheduler tab, you can add, disable, modify, and delete tasks for the opened configuration. GeoMerge scheduled tasks are stored in the folder location specified in the GeoMerge Add-In Settings.

To open Windows Task Schedule for GeoMerge inside of ArcGIS Pro:

- 1. Click the **Add-In** tab on the ArcGIS Pro ribbon at the screen's top.
- 2. Click the **Task Scheduler** button in the GeoMerge group.

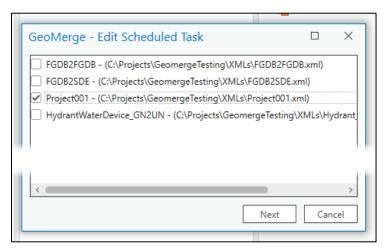
The GeoMerge Scheduled Task window appears. Users can add tasks, edit existing tasks, and delete existing tasks from this window.





Click Add to create a new task.

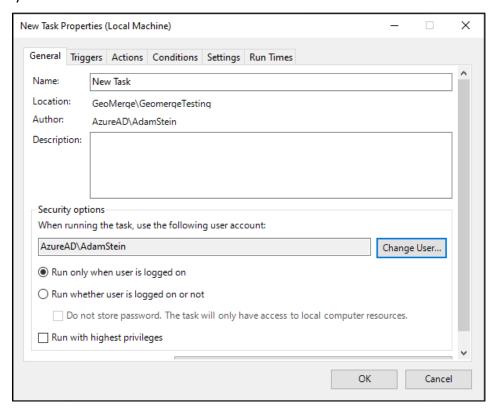
The GeoMerge Edit Scheduled Task window opens. From here, users can select which projects to be scheduled.



- 4. Select projects to be included in the scheduled task.
- 5. Click Next.



The New Task Properties (Local Machine) window appears. From here on, functionality is identical to Windows Task Scheduler. Knowledge base for <u>using Windows Task Scheduler</u> is presented by Microsoft Docs.

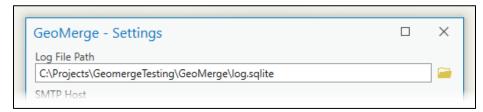




Querying the Log SQLite Database

GeoMerge logs are saved to an SQLite database. The location of this database is specified in the GeoMerge **Settings**, under the **Log File Path** parameter.





The best way to view the logs is to open the SQLite database from the Catalog pane in ArcGIS Pro and query the Messages and Processes tables the same way an attribute table would be viewed. GeoMerge logs can sometimes have multiple lines of text in a single record. Double click on a cell of the Message field of the Messages

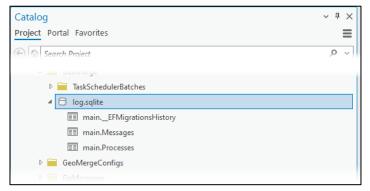
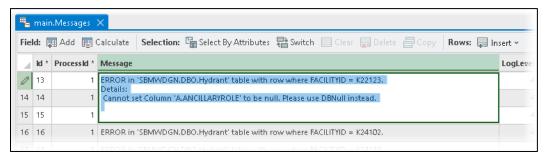


table and enter the editing mode. This will display all the lines of the message.



The screenshot below shows the **Processes** and **Messages** table from the SQLite database log viewed in ArcGIS Pro. The **Id** column of the **Processes** table corresponds to the **ProcessId** field in the **Messages** table which contains the logged messages from GeoMerge.



