Introduction

This exercise consists of 2 sections:

1. How to Prepare Data for Tableau with FME (Processing Spreadsheets) (Current Article)

In Section 1, we'll process a single CSV file and perform data validation and cleanup before loading it into the Data Inspector

2. How to Prepare Data for Tableau with FME (Merging Multiple Spreadsheets)

In Section 2, we'll modify the FME workspace from Section 1 to handle multiple CSV files.

Step-by-Step Instructions

Part 1: Simple Translation

We will start by creating a simple translation, look at the results in Tableau, then come back to FME to do the data validation and cleanup.

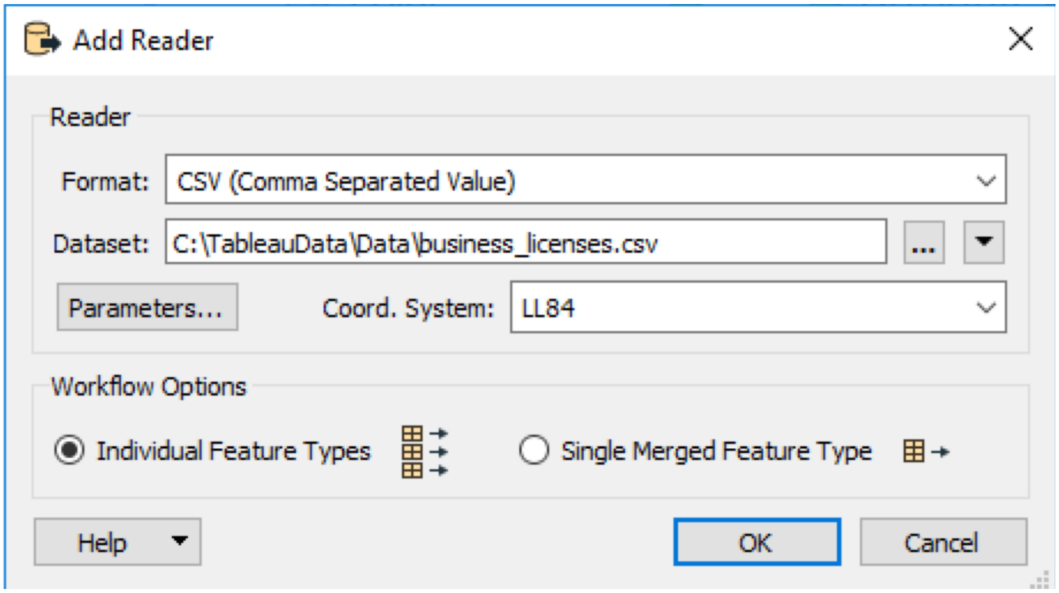
1. Create new workspace.

Start FME Workbench and select the New option under Create Workspace.

2. Set up CSV Reader.

The first step is to read the CSV file. Drag the business license CSV file from the file explorer onto the blank canvas. Notice, that FME has already filled in the reader format and dataset. Alternatively, click the Add Reader on the toolbar.

Reader Format:	CSV (Comma Separated Value)
Reader Dataset:	...\business_licenses.csv
Coord. System:	LL84



Format: CSV (Comma Separated Value)

Dataset: C:\TableauData\Data\business_licenses.csv

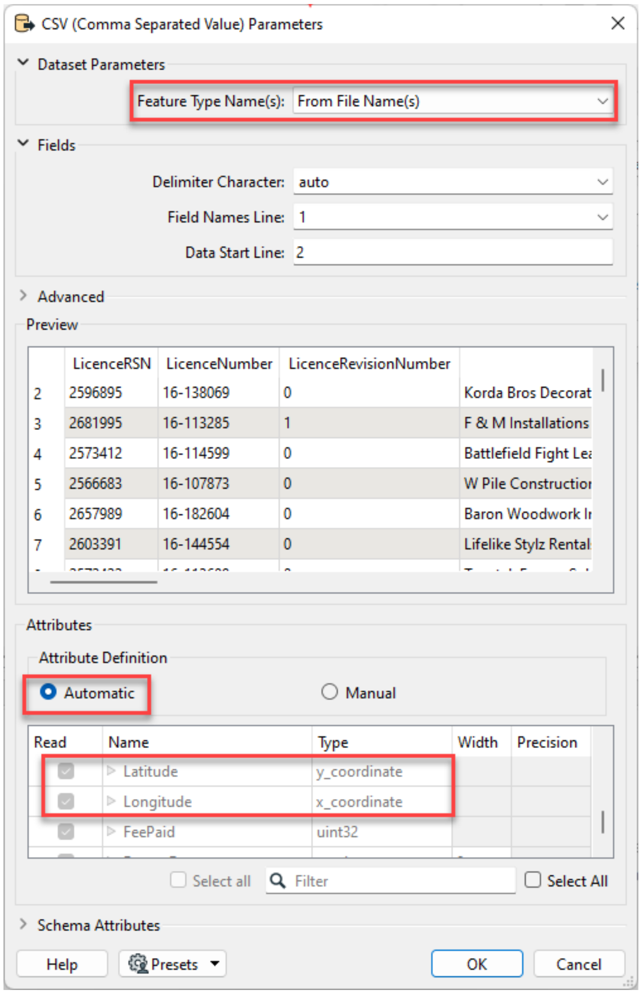
Coord. System: LL84

● Individual Feature Types ○ Single Merged Feature Type

Add a CSV Reader, add the business_licenses.csv, set the coord system, then click on Parameters...

Click on the Parameters button. The Database Parameter allows us to choose different naming schemes for the layers or feature types that end up on the canvas. **Make sure it is set to "Feature Type from File Names".**

Confirm that the Attribute Definition has the Longitude and Latitude attributes set to x_coord and y_coord, respectively. By default, FME will map X/Y or Latitude/Longitude attributes to the x_coord and y_coord data types.



CSV (Comma Separated Value) Parameters

Dataset Parameters

Feature Type Name(s): From File Name(s)

Fields

Delimiter Character: auto

Field Names Line: 1

Data Start Line: 2

Advanced

Preview

	LicenceRSN	LicenceNumber	LicenceRevisionNumber	
2	2596895	16-138069	0	Korda Bros Decorat
3	2681995	16-113285	1	F & M Installations
4	2573412	16-114599	0	Battlefield Fight Lea
5	2566683	16-107873	0	W Pile Constructior
6	2657989	16-182604	0	Baron Woodwork Ir
7	2603391	16-144554	0	Lifelike Stylz Rental

Attributes

Attribute Definition

● Automatic ○ Manual

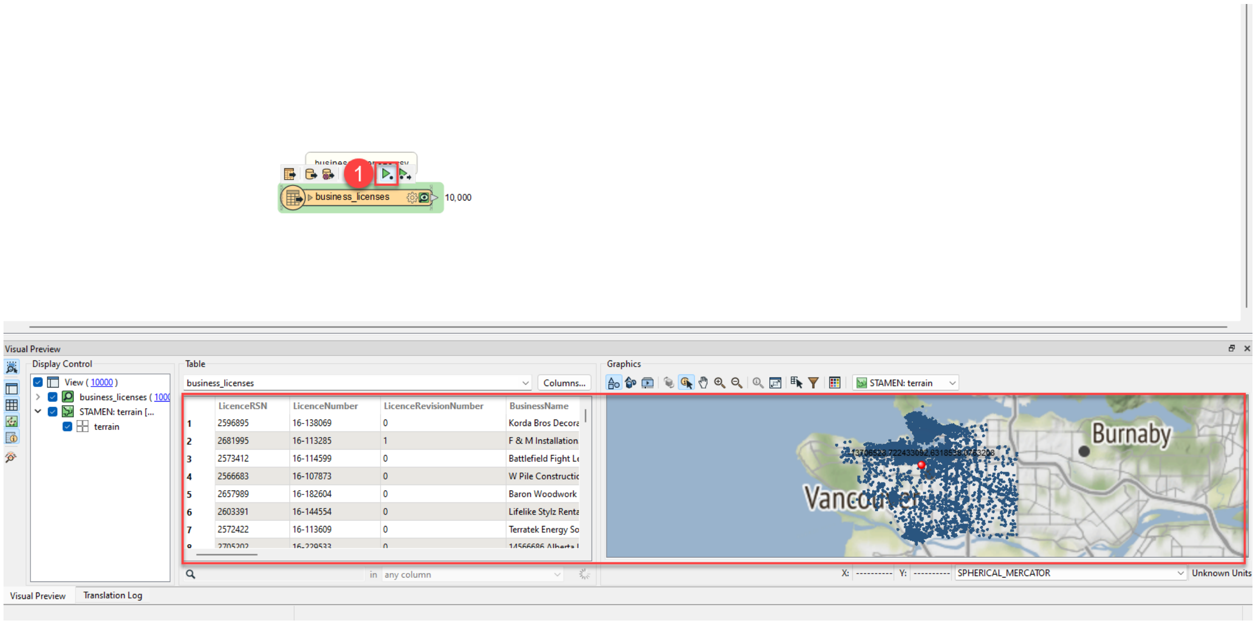
Read	Name	Type	Width	Precision
☑	Latitude	y_coordinate		
☑	Longitude	x_coordinate		
☑	FeePaid	uint32		

If necessary, change the Attribute Definition to Manual and update the Latitude and Longitude

Click Ok, and then click Ok again to add the Reader to the canvas. FME is able to create point geometry for each record with a latitude and longitude value.

3. Confirm points are created as CSV file is read

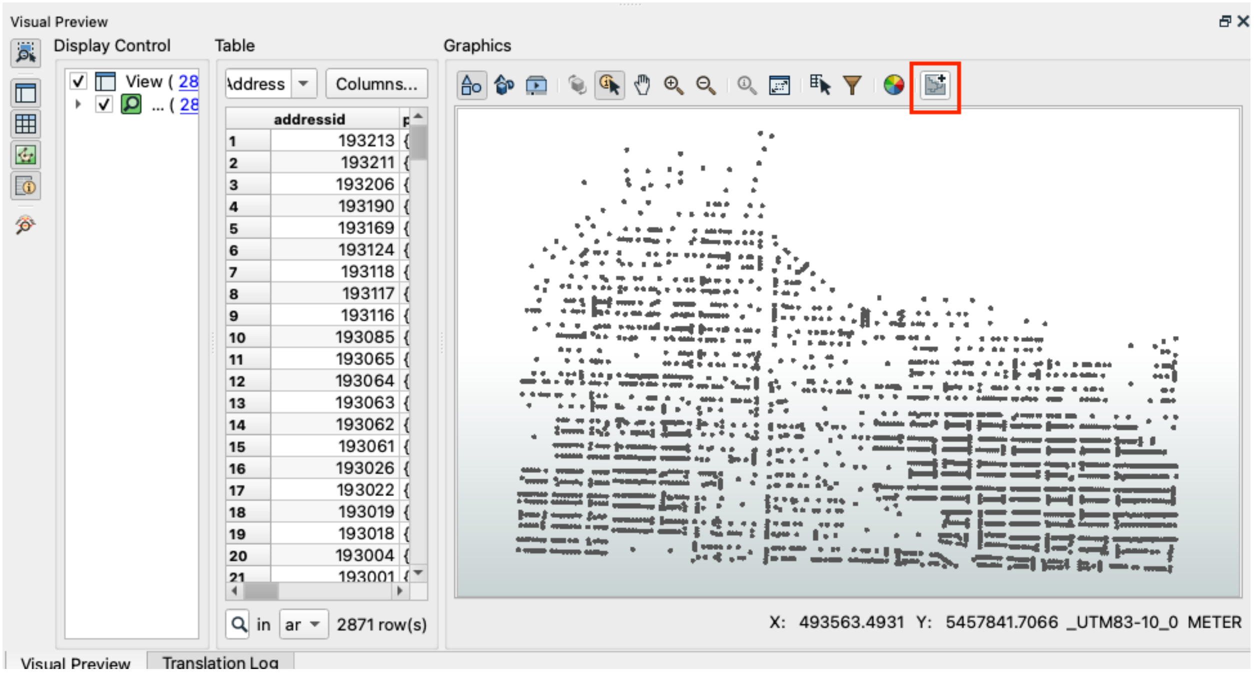
Once the feature type has been added to the canvas, select the business_licenses feature type and click the run to this button. This will run the translation to the selected object and generate a feature cache which can be inspected in the visual preview window or the Data Inspector by clicking on the green feature cache icon. We can see that we do, in fact, have points.



	LicenceRSN	LicenceNumber	LicenceRevisionNumber	BusinessName
1	2596895	16-138069	0	Korda Bros Decora
2	2681995	16-113285	1	F & M Installation
3	2573412	16-114599	0	Battlefield Fight Le
4	2566683	16-107873	0	W Pile Constructic
5	2657989	16-182604	0	Baron Woodwork
6	2603391	16-144554	0	Lifelike Stylz Renta
7	2572422	16-113609	0	Terratek Energy So
8	2705202	16-229533	0	14566686 Alberta I

Business Licenses with point data in the Visual Preview Window

If you are missing the background map, you can easily add it using the add a background map button on the Visual Preview toolbar.

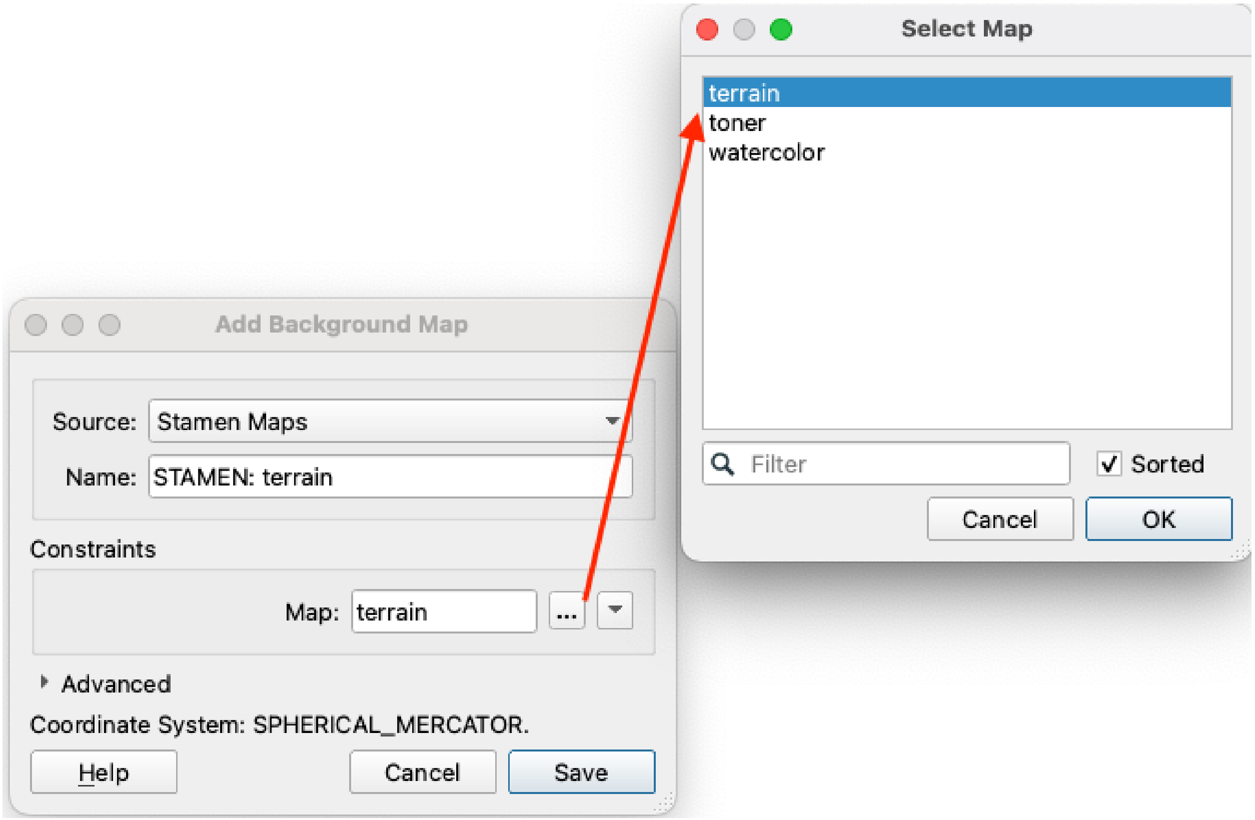


	addressid	p
1	193213	{
2	193211	{
3	193206	{
4	193190	{
5	193169	{
6	193124	{
7	193118	{
8	193117	{
9	193116	{
10	193085	{
11	193065	{
12	193064	{
13	193063	{
14	193062	{
15	193061	{
16	193026	{
17	193022	{
18	193019	{
19	193018	{
20	193004	{
21	193001	{

2871 row(s)

X: 493563.4931 Y: 5457841.7066 _UTM83-10_0 METER

Here you can choose from a variety of background map services. Select the Stamen Maps: Terrain background map and then click Save to apply it.



Add Background Map

Source: Stamen Maps

Name: STAMEN: terrain

Constraints

Map: terrain

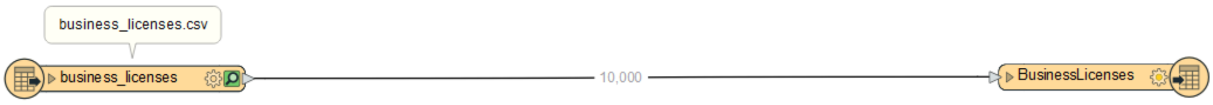
Coordinate System: SPHERICAL_MERCATOR.

Select Map

☑ Sorted

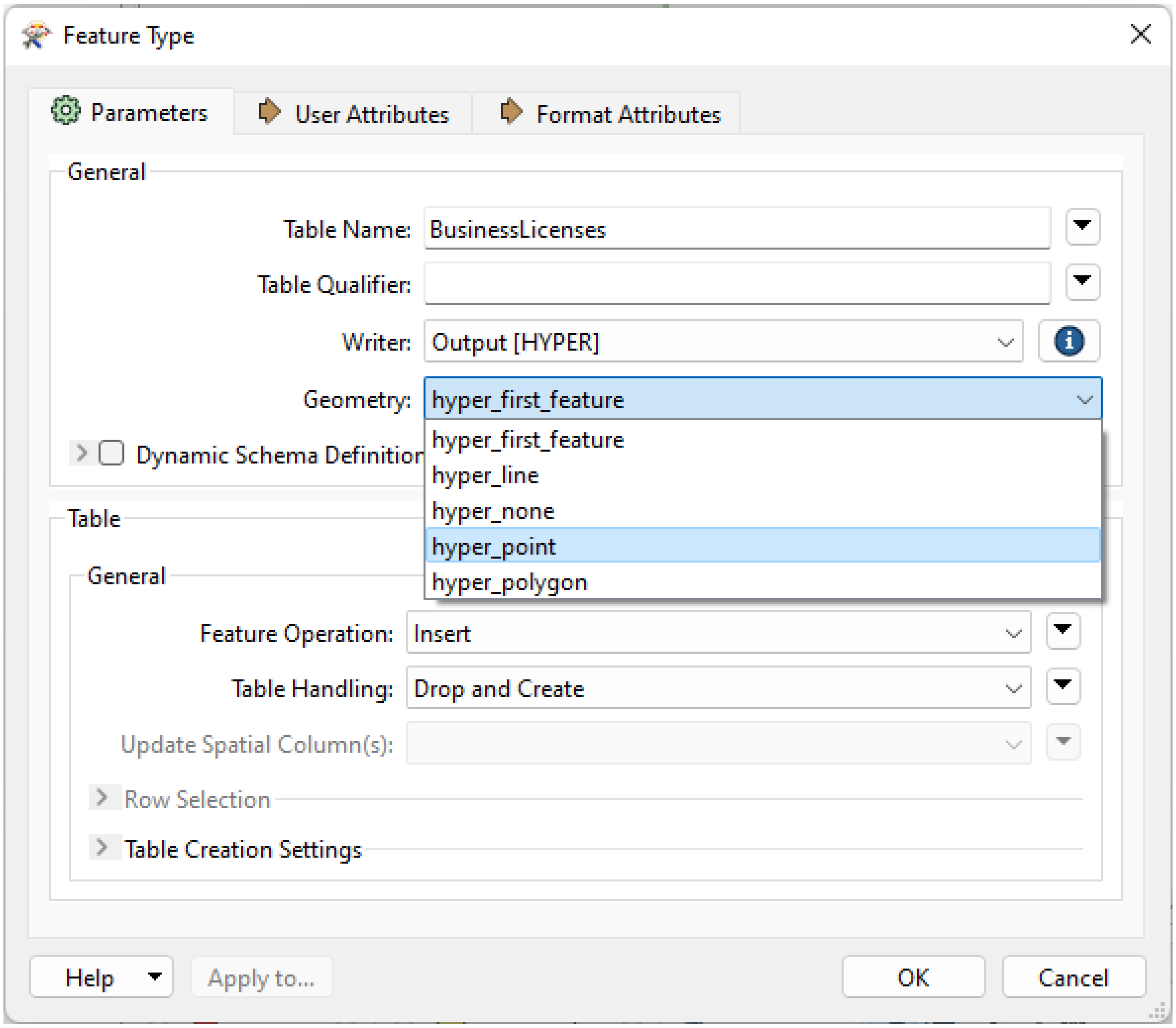
4. Add Tableau writer

From the Writers menu, select Add Writer or using the Quick Add Menu, start typing Tableau, and select the Tableau Hyper format. For Dataset, specify a directory in which to write the .hyper file. Lastly, set the Table Definition to Automatic then click OK to add the Tableau writer to the workspace. Then connect the Reader to the Writer.



5. Modify writer feature type properties

Open the properties of the Writer. We can now specify the name of the table we would like to write to. Call it BusinessLicenses.



General

Table Name: BusinessLicenses

Table Qualifier:

Writer: Output [HYPER]

Geometry: hyper_first_feature

› ☐ Dynamic Schema Definition

Table

General

Feature Operation: Insert

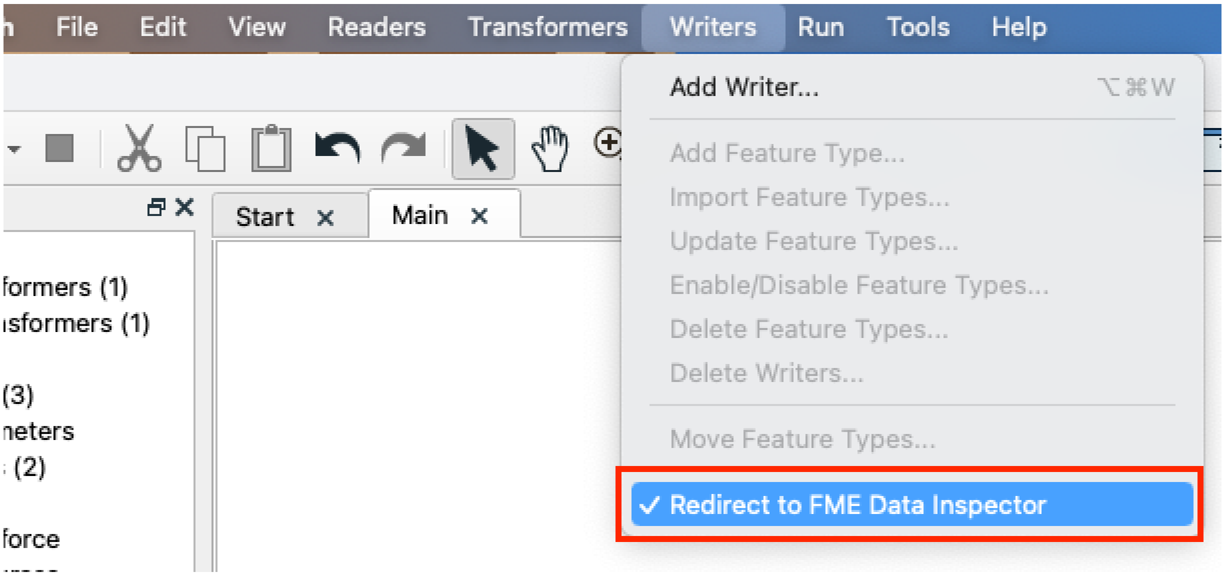
Table Handling: Drop and Create

Update Spatial Column(s):

Change the Writer Feature Type Properties by changing the Table Name

6. Run workspace

Before running the workspace, enable the Redirect to FME Data Inspector option in the Menu > Writers > Redirect to FME Data Inspector (should have a check mark). *We are enabling this so we can preview the output directly in the Data Inspector as we do not have Tableau licenses on the training machines and because not all attendees are Tableau users.*



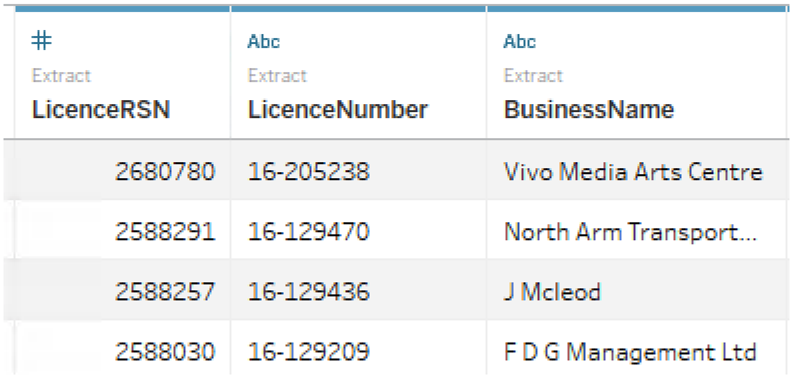
With Redirect to FME Data Inspector enabled, click the Run button to run the workspace.

You may have noticed a number of blue warnings go by in the log file. These are related to problems with the CSV data, which we will soon fix with FME.

7. Examine output in the Visual Preview Window

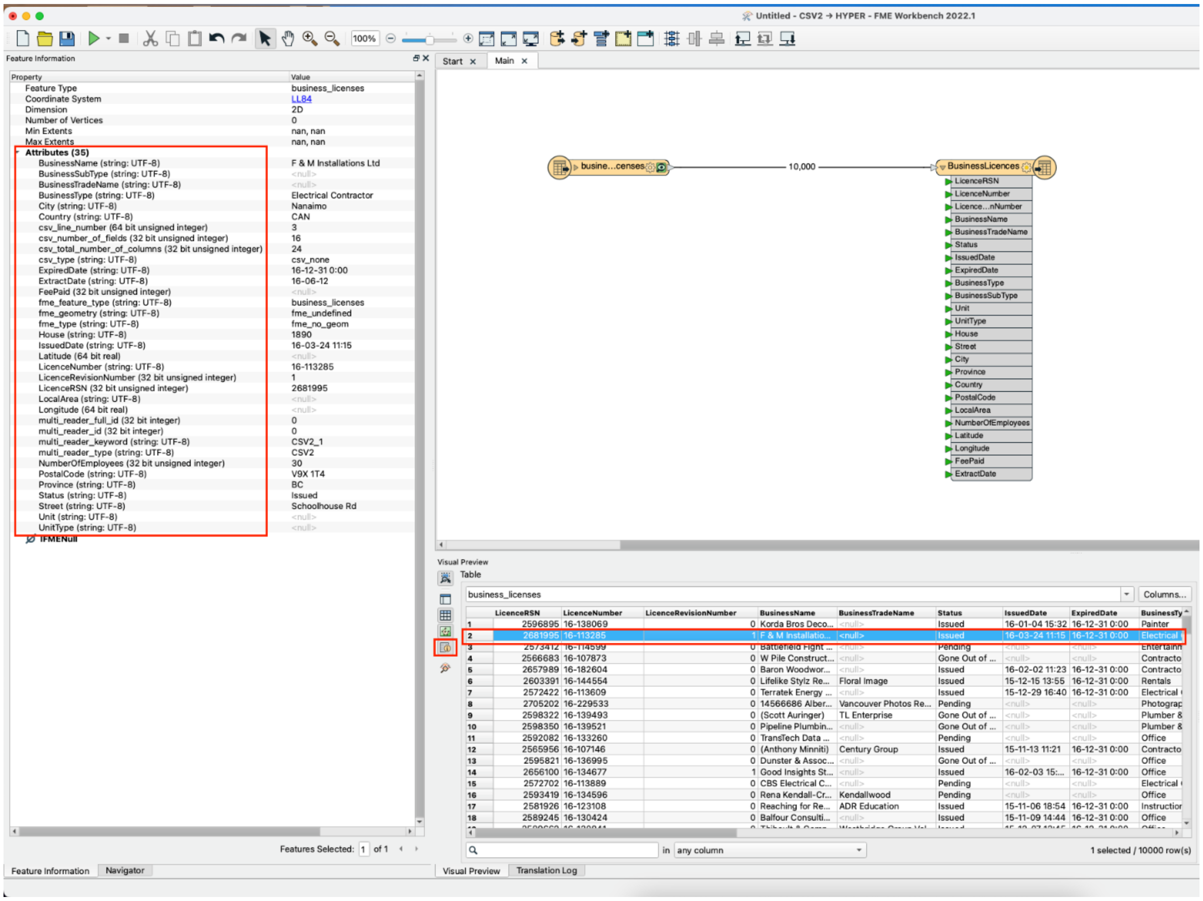
In the Visual Preview window, we can see that all of the columns correspond to the columns we read in from the CSV file with FME. Notice that the data types of the columns have all been set automatically by FME based on the best guess at what kind of data is inside each one. If desired, you can manually set the data types, width and precision in the writer feature type on the User Attributes tab by changing the Attribute Definition to Manual.

If we were to open the output in Tableau, the result would look like the image below where we can see that the LicenseRSN has correctly been set to a Number type and BusinessName is a String.



# Extract LicenceRSN	Abc Extract LicenceNumber	Abc Extract BusinessName
2680780	16-205238	Vivo Media Arts Centre
2588291	16-129470	North Arm Transport...
2588257	16-129436	J Mcleod
2588030	16-129209	F D G Management Ltd

View the data in Visual Preview to ensure it has set the correct data types. You can view data types by enabling the Feature Information Window button *on the Visual Preview toolbar.*



Feature Information

Property	Value
Feature Type	business_licenses
Coordinate System	LL84
Dimension	2D
Number of Vertices	0
Min Extents	nan, nan
Max Extents	nan, nan
Attributes (35)	
BusinessName (string: UTF-8)	F & M Installations Ltd
BusinessSubType (string: UTF-8)	<null>
BusinessTradeName (string: UTF-8)	<null>
BusinessType (string: UTF-8)	Electrical Contractor
City (string: UTF-8)	Nanaimo
Country (string: UTF-8)	CAN
csv_line_number (64 bit unsigned integer)	3
csv_number_of_fields (32 bit unsigned integer)	16
csv_total_number_of_columns (32 bit unsigned integer)	24
csv_type (string: UTF-8)	csv_none
ExpiredDate (string: UTF-8)	16-12-31 0:00
ExtractDate (string: UTF-8)	16-06-12
FeePaid (32 bit unsigned integer)	<null>
fme_feature_type (string: UTF-8)	business_licenses
fme_geometry (string: UTF-8)	fme_undefined
fme_type (string: UTF-8)	fme_no_geom
House (string: UTF-8)	1890
IssuedDate (string: UTF-8)	16-03-24 11:15
Latitude (64 bit real)	<null>
LicenceNumber (string: UTF-8)	16-113285
LicenceRevisionNumber (32 bit unsigned integer)	1
LicenceRSN (32 bit unsigned integer)	2681995
LocalArea (string: UTF-8)	<null>
Longitude (64 bit real)	<null>
multi_reader_full_id (32 bit integer)	0
multi_reader_id (32 bit integer)	0
multi_reader_keyword (string: UTF-8)	CSV2_1
multi_reader_type (string: UTF-8)	CSV2
NumberOfEmployees (32 bit unsigned integer)	30
PostalCode (string: UTF-8)	V9X 1T4
Province (string: UTF-8)	BC
Status (string: UTF-8)	Issued
Street (string: UTF-8)	Schoolhouse Rd
Unit (string: UTF-8)	<null>
UnitType (string: UTF-8)	<null>
IFMENull	

Features Selected: 1 of 1

Visual Preview

business_licenses

	LicenceRSN	LicenceNumber	LicenceRevisionNumber	BusinessName	BusinessTradeName	Status	IssuedDate	ExpiredDate	BusinessTy
1	2596895	16-138069	0	Korda Bros Deco...	<null>	Issued	16-01-04 15:32	16-12-31 0:00	Painter
2	2681995	16-113285	1	F & M Installatio...	<null>	Issued	16-03-24 11:15	16-12-31 0:00	Electrical
3	2573412	16-114599	0	Battlefield Fight ...	<null>	Pending	<null>	<null>	Entertainn
4	2566683	16-107873	0	W Pile Construct...	<null>	Gone Out of ...	<null>	<null>	Contracto
5	2657989	16-182604	0	Baron Woodwor...	<null>	Issued	16-02-02 11:23	16-12-31 0:00	Contracto
6	2603391	16-144554	0	Lifelike Stylz Re...	Floral Image	Issued	15-12-15 13:55	16-12-31 0:00	Rentals
7	2572422	16-113609	0	Terratek Energy ...	<null>	Issued	15-12-29 16:40	16-12-31 0:00	Electrical
8	2705202	16-229533	0	14566686 Alber...	Vancouver Photos Re...	Pending	<null>	<null>	Photograp
9	2598322	16-139493	0	(Scott Auringer)	TL Enterprise	Gone Out of ...	<null>	<null>	Plumber &
10	2598350	16-139521	0	Pipeline Plumbin...	<null>	Gone Out of ...	<null>	<null>	Plumber &
11	2592082	16-133260	0	TransTech Data ...	<null>	Pending	<null>	<null>	Office
12	2565956	16-107146	0	(Anthony Minniti)	Century Group	Issued	15-11-13 11:21	16-12-31 0:00	Contracto
13	2595821	16-136995	0	Dunster & Assoc...	<null>	Gone Out of ...	<null>	<null>	Office
14	2656100	16-134677	1	Good Insights St...	<null>	Issued	16-02-03 15:...	16-12-31 0:00	Office
15	2572702	16-113889	0	CBS Electrical C...	<null>	Pending	<null>	<null>	Electrical
16	2593419	16-134596	0	Rena Kendall-Cr...	Kendallwood	Pending	<null>	<null>	Office
17	2581926	16-123108	0	Reaching for Re...	ADR Education	Issued	15-11-06 18:54	16-12-31 0:00	Instructior
18	2589245	16-130424	0	Balfour Consulti...	<null>	Issued	15-11-09 14:44	16-12-31 0:00	Office

1 selected / 10000 row(s)

Part 2: Data Validation and Cleanup

Let's take a closer look at the business license data.

Here is a list of tasks we will accomplish with FME. We have already completed the first one in our current workspace. We will modify the workspace to perform the rest of the tasks.

- Read Excel file and create points
- Filter out records that don't have latitude/longitude values
- Ensure PostalCode has a value; extract first 3 characters
- Set up conditional value to handle empty FeePaid values
- Create new BusinessDisplayName field; populate from existing fields

1. Filter out records that don't have latitude/longitude values

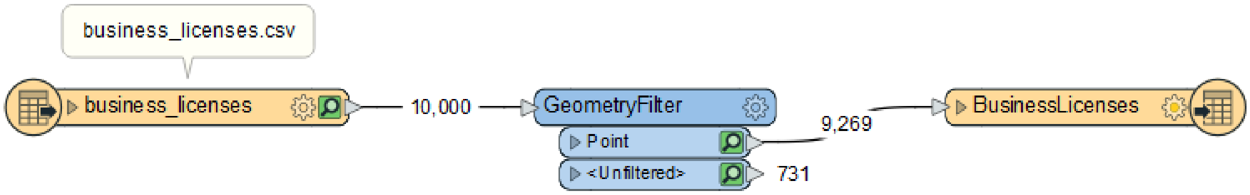
Some of the records in the CSV file did not have latitude and longitude values. Since FME would not have been able to create points for them, we want to filter them out; a GeometryFilter will help us accomplish this.

Click on connection between the CSV Reader Feature Type and the Writer Feature Type and then start typing "GeometryFilter" click enter. Click enter again to enter the Transformer Parameters. Leave the Mode as Simple and select "Point" for the "Output Types”. Then click Ok to accept the parameters.

2. Run workspace with feature caching enabled

Run the workspace to generate feature caches on the GeometryFilter. If it's not already enabled, you can turn feature caching on in the Run submenu > Enable Feature Caching

We can confirm that 731, out of our 10,000 records did not have latitude or longitude values because no point geometry was created for these features.

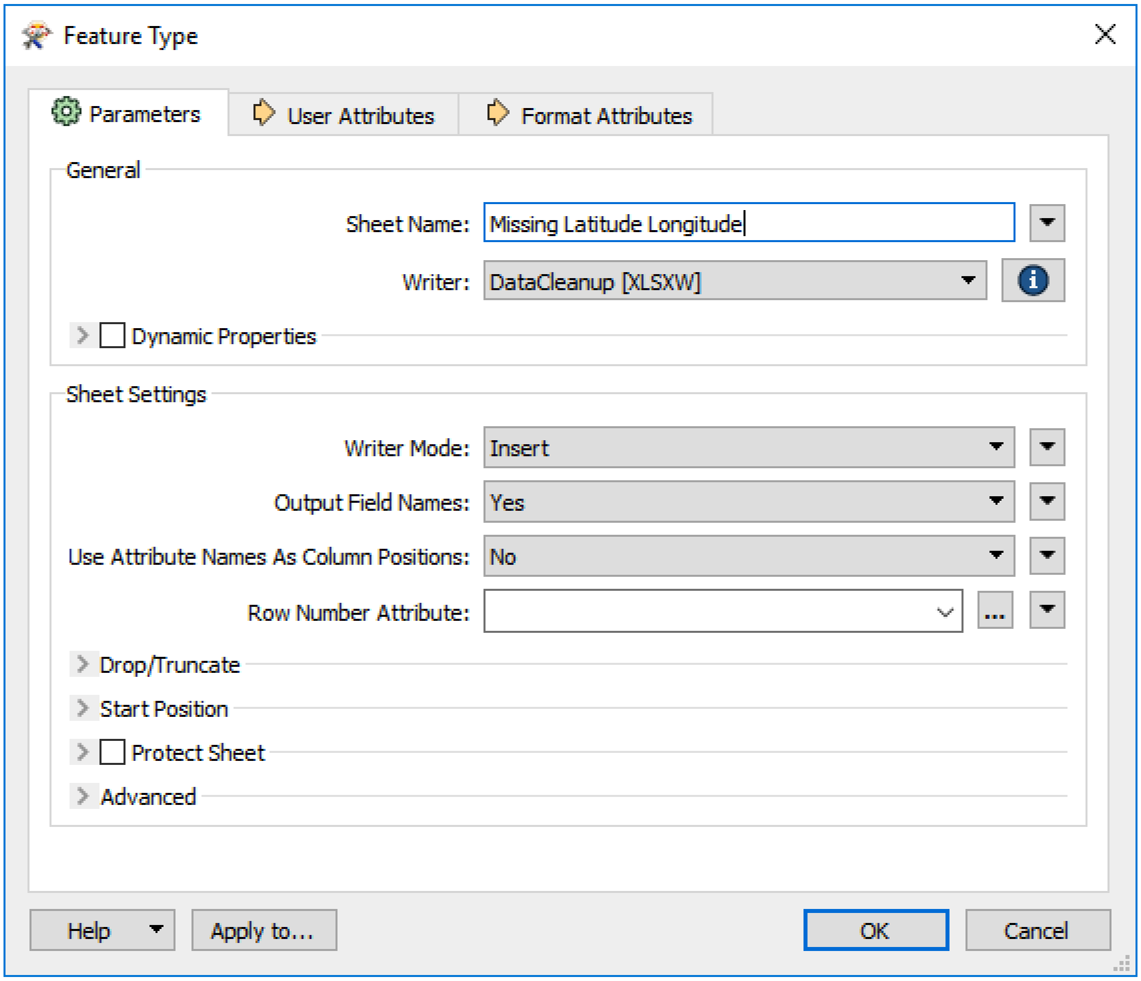


Workspace with feature caching turned on to view <Unfiltered> count

3. Write records with no geometry to "Data Cleanup" Excel file

Before we continue processing the points, let's write these records out to a "Data Cleanup" file, so that they may be fixed. We will write them out to Excel.

From the Writers menu, add an Excel writer. Write it to the output folder and **call the file DataCleanup.xlsx**, and **set the Sheet Deinition to Automatic** then click Ok to add the writer to the canvas. Connect the new writer feature type up to the unfiltered port of the GeometryFilter, then open up the Writer's properties and change the sheet name to "Missing Latitude Longitude".



General

Sheet Name: Missing Latitude Longitude

Writer: DataCleanup [XLSXW]

□ Dynamic Properties

Sheet Settings

Writer Mode: Insert

Output Field Names: Yes

Use Attribute Names As Column Positions: No

Row Number Attribute:

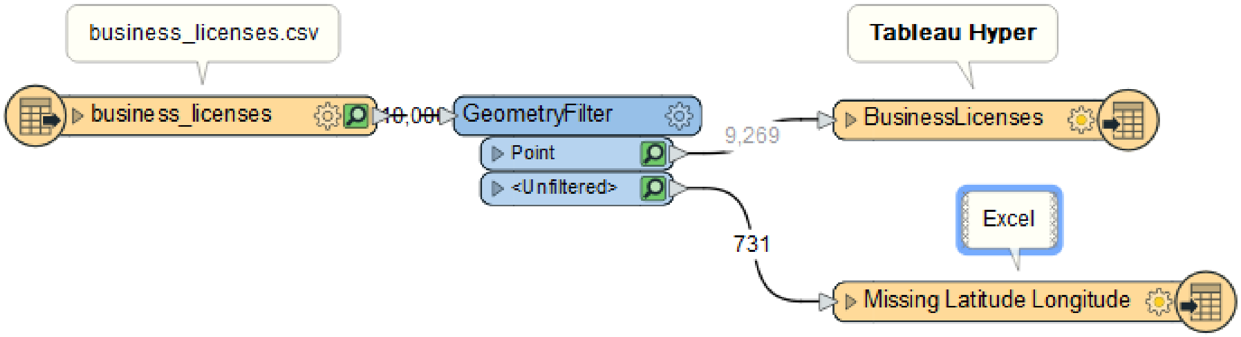
Drop/Truncate

Start Position

□ Protect Sheet

Advanced

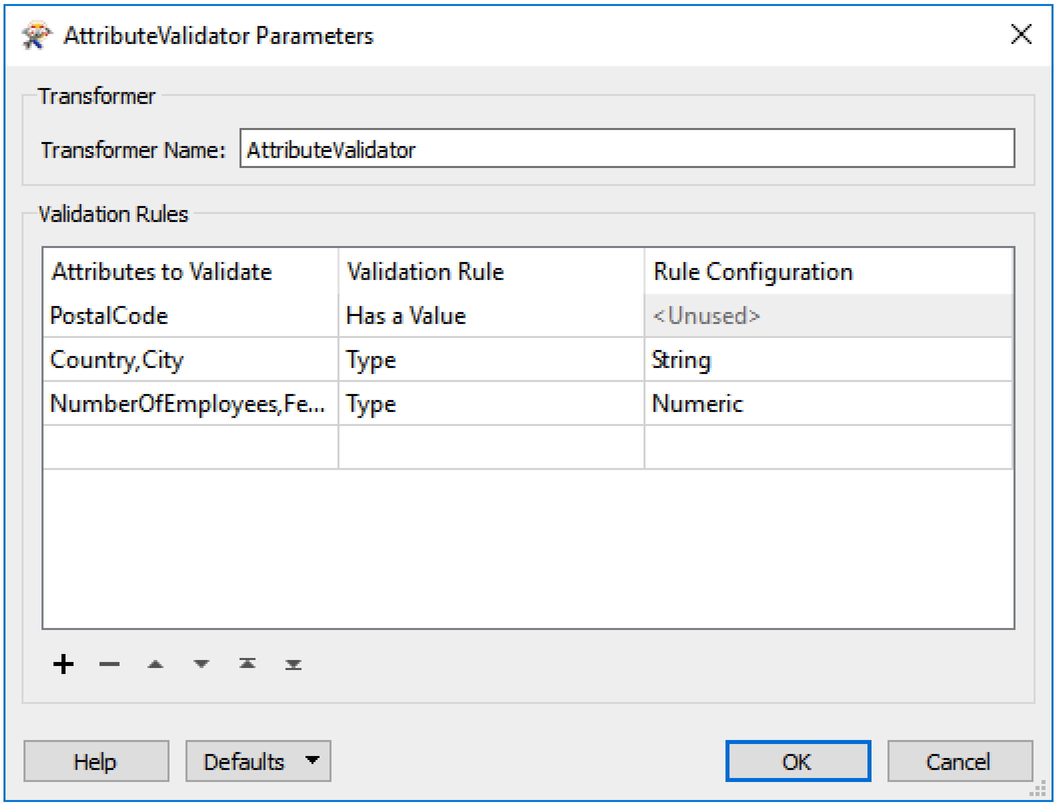
Change the name of the sheet to identify what we are recording



We will return to this stream of features later on in the exercise, but for now, let's continue processing the points.

4. Ensure PostalCode has values: AttributeValidator

Place an AttributeValidator on the canvas and connect it to GeometryFilter's Point output port. Open its properties and select PostalCode for the Attribute to Validate. The validation rule is that PostalCode "Has a Value". Also, validate that some of the string fields have string values and that the numeric fields have numeric values. For example, Country & City should be String data types, and NumberOfEmployees, FeePaid should be Numeric.



AttributeValidator Parameters

Transformer

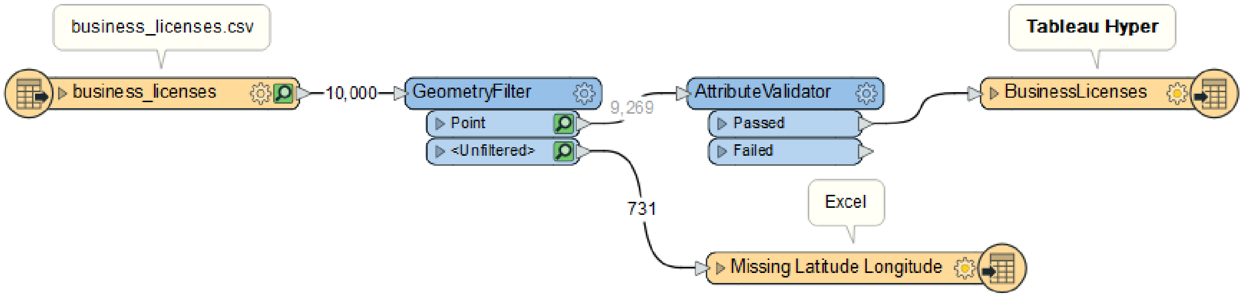
Transformer Name: AttributeValidator

Validation Rules

Attributes to Validate	Validation Rule	Rule Configuration
PostalCode	Has a Value	<Unused>
Country,City	Type	String
NumberOfEmployees,Fe...	Type	Numeric

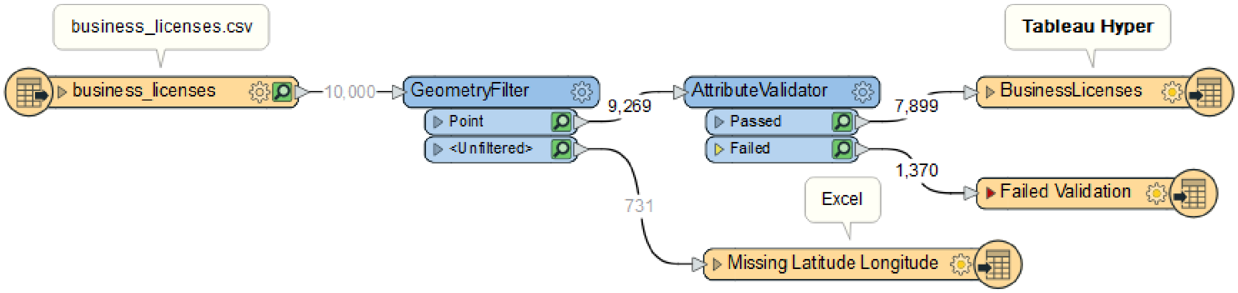
Help | Defaults | OK | Cancel

Set the AttributeValidator to validate if PostalCode has a value and other attributes are the proper type



5. Write records that fail validation to new sheet in "Data Cleanup" Excel file

Again, before continuing to process the valid data, write the data that fails validation out to a different sheet in the "Data Cleanup" excel file already set up. Right-click on the canvas and select "Insert Writer Feature Type". Call the new sheet "Failed Validation". Connect it to the Failed port of the AttributeValidator.



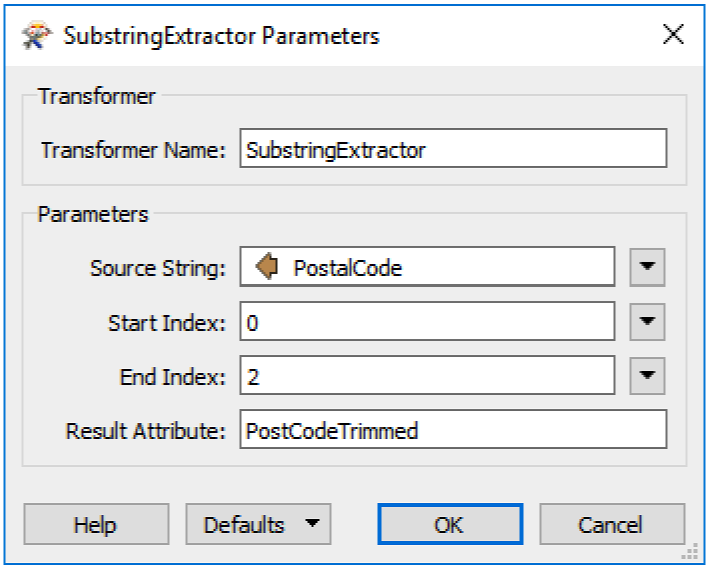
6. Extract first 3 characters of PostalCode: SubStringExtractor

Now that we know that the "records output" from the AttributeValidator all have a value for Postal Code, let's extract the first 3 characters. We do this because Tableau uses the first 3 characters of the postal code to automatically map the areas.

Place a SubstringExtractor on the canvas, connect it to the Passed port of the AttributeValidator, and configure it to extract the first 3 characters from the PostalCode Attribute. We will call the resulting attribute PostCodeTrimmed.

FME indexes the first value as 0 then counts from there. As you can see in the table below, if we only want the first 3 characters in the postal code, we would go from 0 to 2. So in the SubstringExtractor our Start Index = 0 and our End Index = 2.

V	3	W	<Space>	1	J	8
0	1	2	3	4	5	6


SubstringExtractor Parameters

Transformer

Transformer Name: SubstringExtractor

Parameters

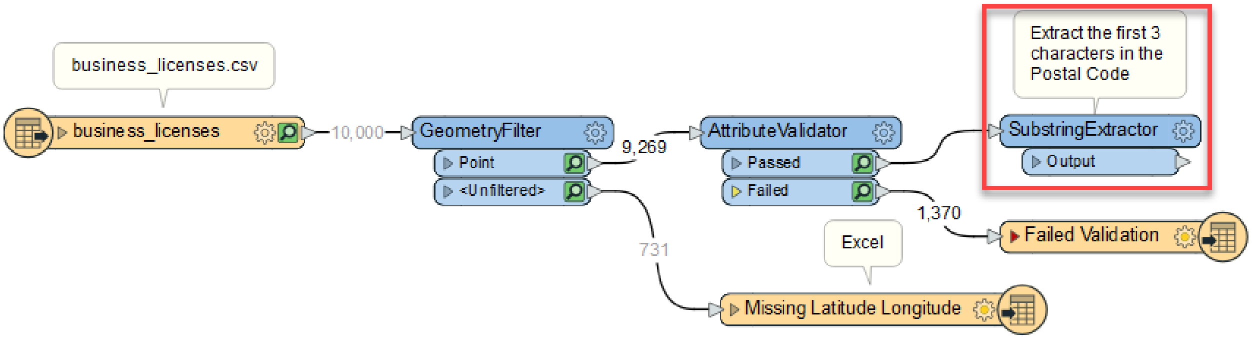
Source String: PostalCode

Start Index: 0

End Index: 2

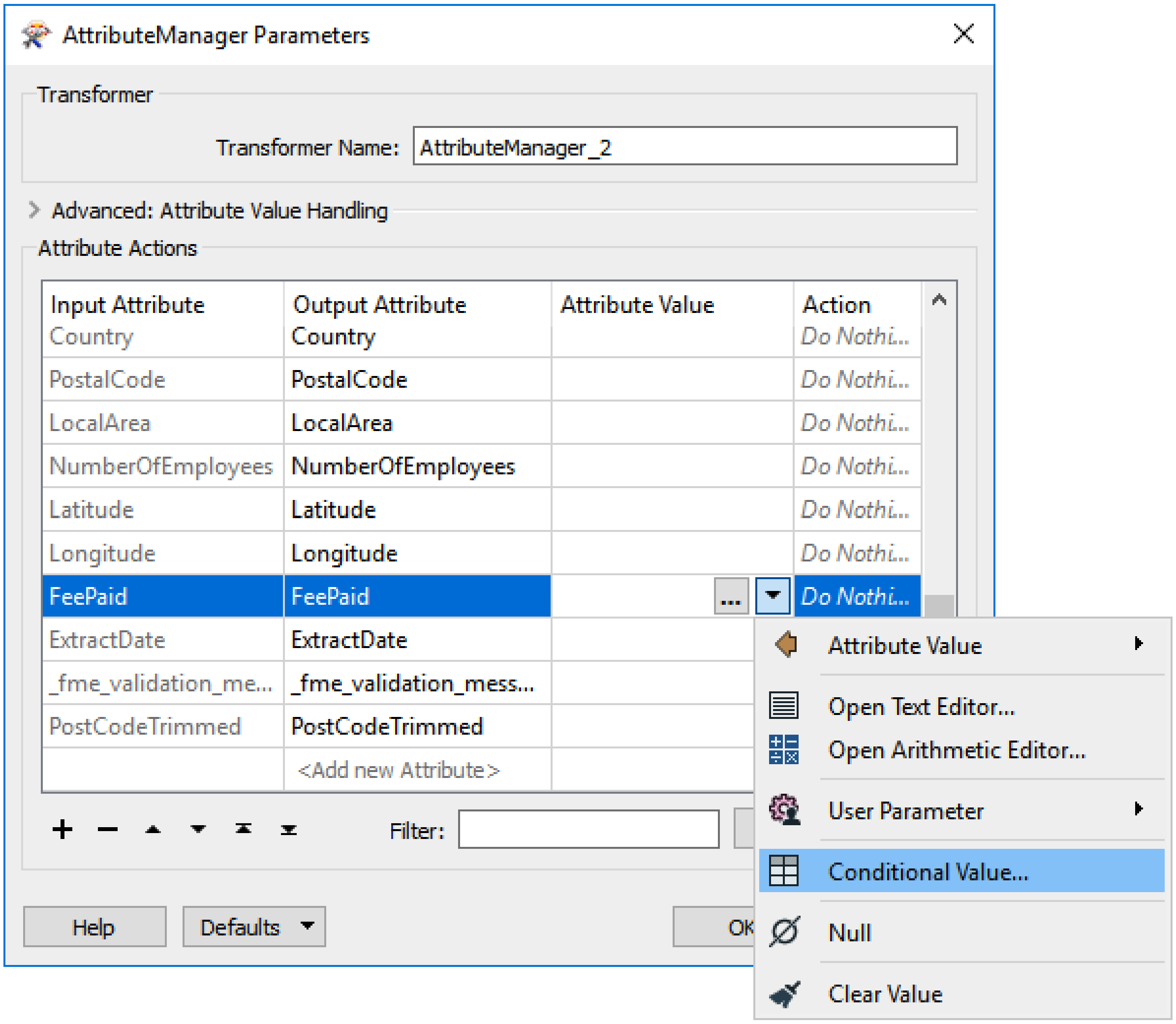
Result Attribute: PostCodeTrimmed

Setup the SubstringExtractor to extract the first 3 values from PostalCode



7. Set up conditional attribute values for FeePaid: AttributeManager

The AttributeManager is a transformer that allows us to do many attribute manipulations, including setting up conditional values. Add the AttributeManager after the SubstringExtractor



AttributeManager Parameters

Transformer

Transformer Name: AttributeManager_2

Advanced: Attribute Value Handling

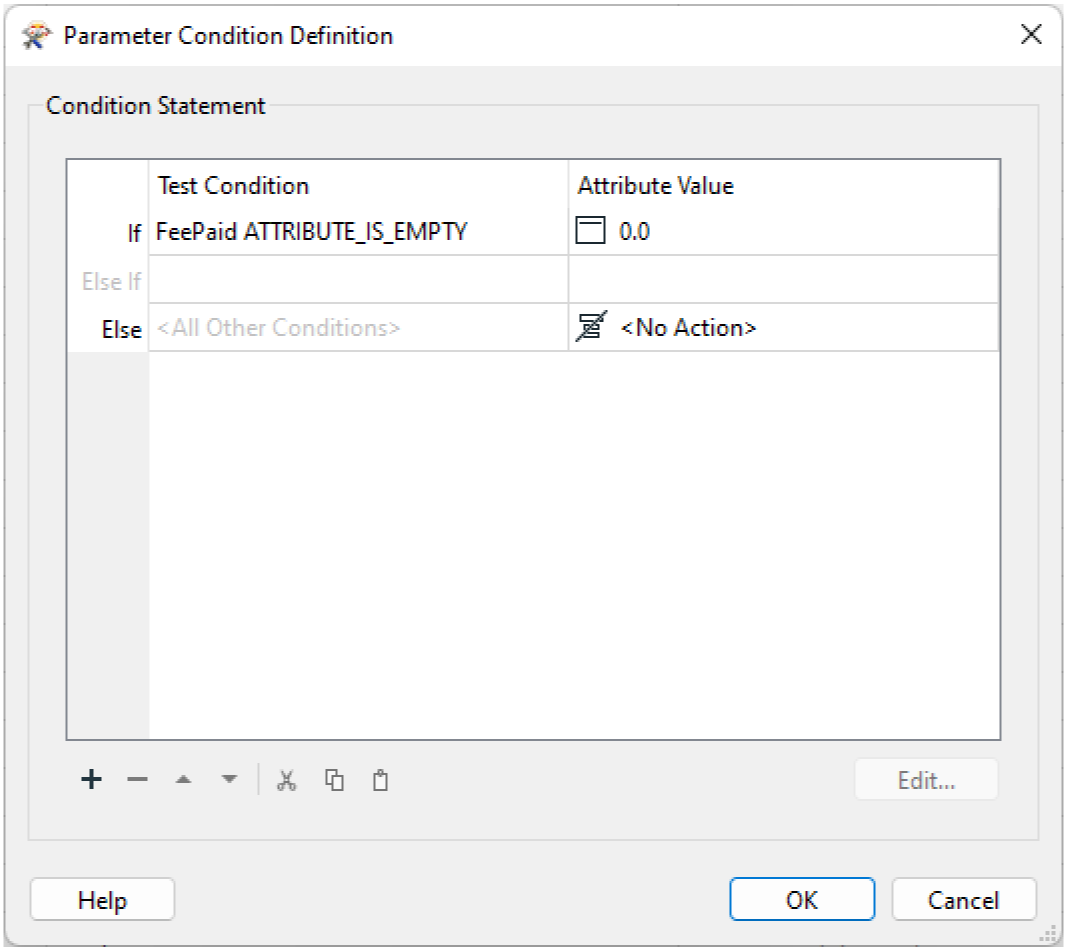
Attribute Actions

Input Attribute	Output Attribute	Attribute Value	Action
Country	Country		Do Nothi...
PostalCode	PostalCode		Do Nothi...
LocalArea	LocalArea		Do Nothi...
NumberOfEmployees	NumberOfEmployees		Do Nothi...
Latitude	Latitude		Do Nothi...
Longitude	Longitude		Do Nothi...
FeePaid	FeePaid		Do Nothi...
ExtractDate	ExtractDate		
_fme_validation_me...	_fme_validation_mess...		
PostCodeTrimmed	PostCodeTrimmed		
	<Add new Attribute>		

Filter:

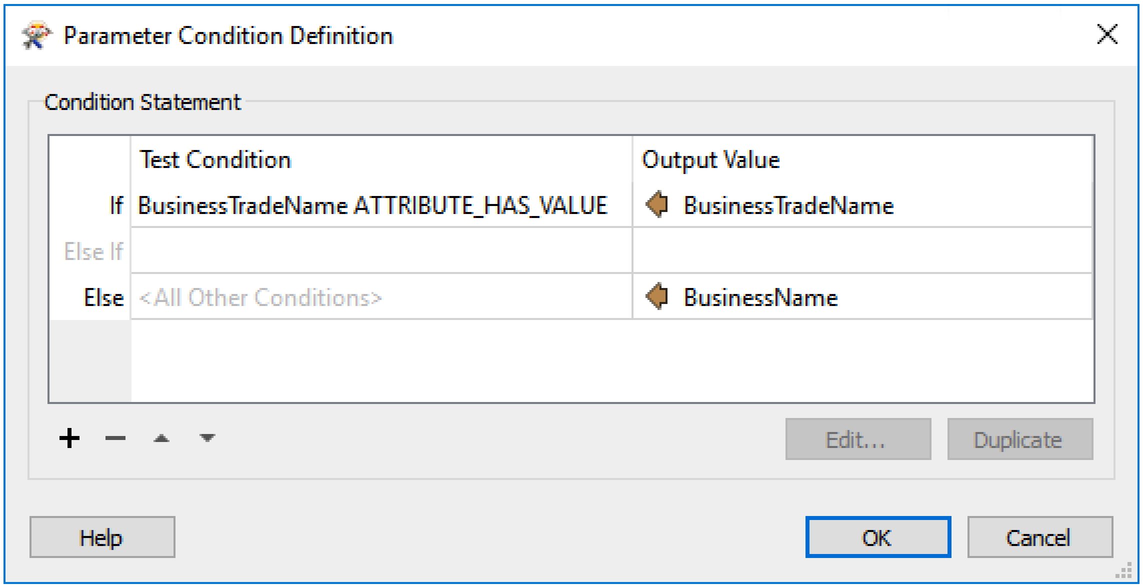
Create a Conditional Value in the AttributeManager for FeePaid

If the FeePaid attribute is empty, set the value to 0, otherwise, leave it as is.



	Test Condition	Attribute Value
If	FeePaid ATTRIBUTE_IS_EMPTY	0.0
Else If		
Else	<All Other Conditions>	<No Action>

Create a new attribute called BusinessDisplayName. Set its value to BusinessTradeName, but only if BusinessTradeName has a value, otherwise set it to BusinessName.

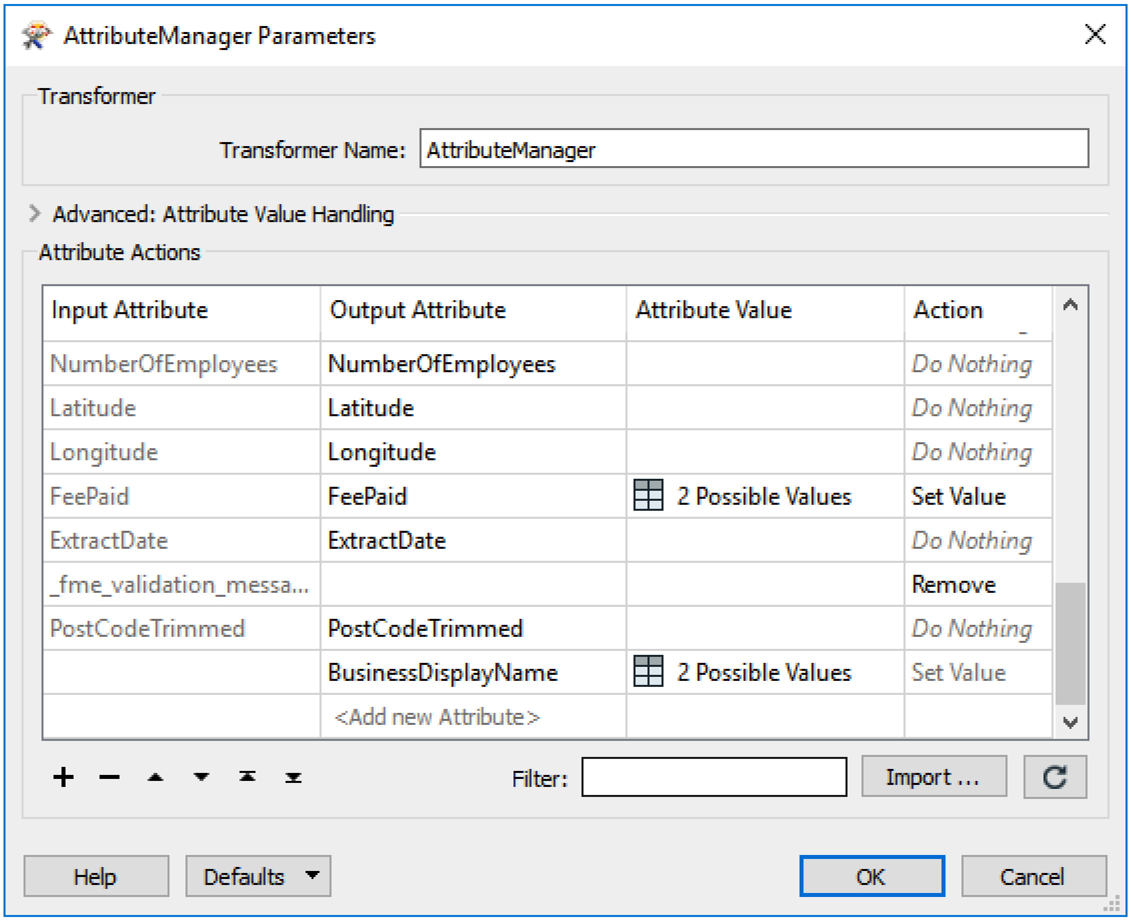


Parameter Condition Definition

Condition Statement

	Test Condition	Output Value
If	BusinessTradeName ATTRIBUTE_HAS_VALUE	BusinessTradeName
Else If		
Else	<All Other Conditions>	BusinessName

If BusinessTradeName has an attribute Value, keep it BusinessTradeName otherwise name it BusinessName



AttributeManager Parameters

Transformer

Transformer Name: AttributeManager

› Advanced: Attribute Value Handling

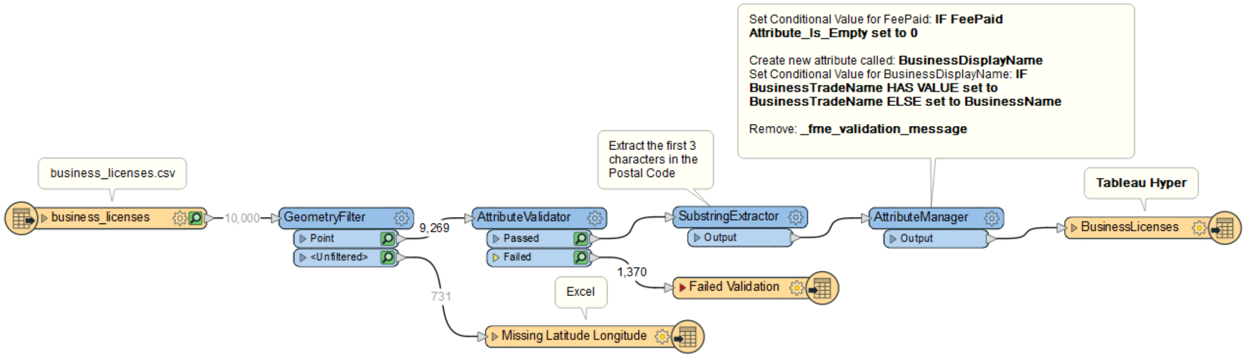
Attribute Actions

Input Attribute	Output Attribute	Attribute Value	Action
NumberOfEmployees	NumberOfEmployees		Do Nothing
Latitude	Latitude		Do Nothing
Longitude	Longitude		Do Nothing
FeePaid	FeePaid	⊞ 2 Possible Values	Set Value
ExtractDate	ExtractDate		Do Nothing
_fme_validation_messa...			Remove
PostCodeTrimmed	PostCodeTrimmed		Do Nothing
	BusinessDisplayName	⊞ 2 Possible Values	Set Value
	<Add new Attribute>		

Filter:

In the AttributeManager, create 2 conditional values for FeePaid and BusinessDisplayName. This is also where you can re-order your attributes if you want your columns ordered in a particular way. Note: if you are changing the order of attributes and you are working with a schema that already exists, you may need to drop and create the table to invoke the changes.

Connect the AttributeManager output to the Writer feature type.



Set Conditional Value for FeePaid: **IF FeePaid Attribute_Is_Empty set to 0**

Create new attribute called: **BusinessDisplayName**
Set Conditional Value for BusinessDisplayName: **IF BusinessTradeName HAS VALUE set to BusinessTradeName ELSE set to BusinessName**

Remove: **_fme_validation_message**

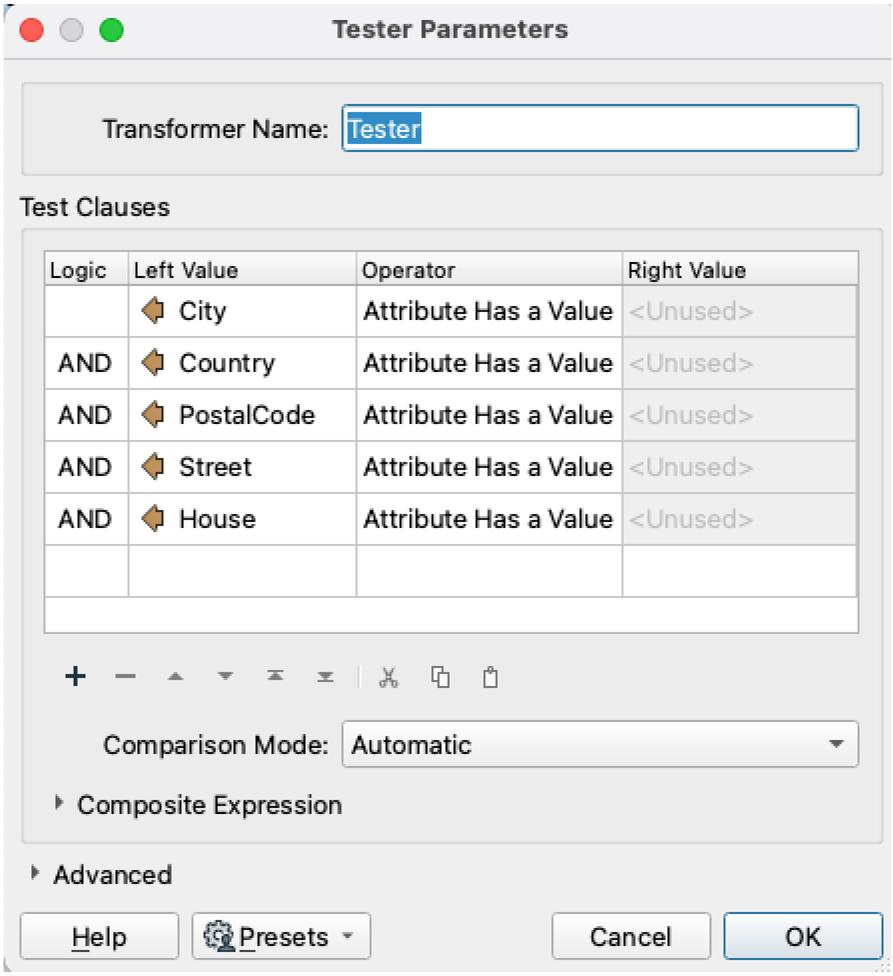
Extract the first 3 characters in the Postal Code

Your workspace should now look like the image above. Next we will work on the <Unfiltered> output port on the GeometryFilter.

8. Filter for features to Geocode

Since the GeometryFilter is filtering for features with point geometry, we know our unfiltered points are missing X (longitude) and Y (latitude) values. However, we also know that this dataset contains address information which we can use to geocode in order to obtain Latitude and Longitude values. Rather than simply connecting the <Unfiltered> features to a Geocoder, we'll first filter out any features that do not contain address information.

Add the Tester after the GeometryFilter and connect it to the Unfiltered output port. Once connected, set the following Test Clauses to ensure attributes containing address information have a value. For example, City, Country, PostalCode, Street, AND House should have a value. *Note: the Logic parameter is set to AND to ensure each feature has a value for each of the attributes we have listed in the Test Clauses.*



Tester Parameters

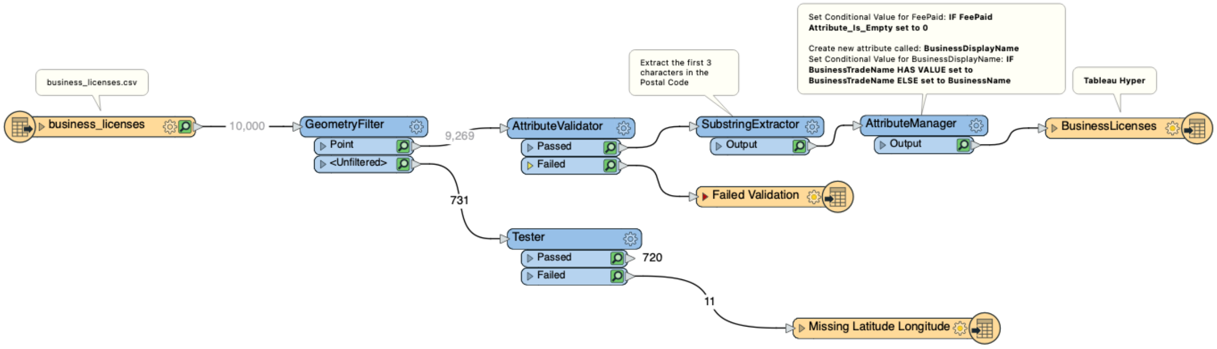
Transformer Name: Tester

Test Clauses

Logic	Left Value	Operator	Right Value
	City	Attribute Has a Value	<Unused>
AND	Country	Attribute Has a Value	<Unused>
AND	PostalCode	Attribute Has a Value	<Unused>
AND	Street	Attribute Has a Value	<Unused>
AND	House	Attribute Has a Value	<Unused>

Comparison Mode: Automatic

Since we want to geocode features that meet this criteria, the failed port can be connected to the Missing Latitude Longitude writer feature type (shown below) as these will need to be manually reviewed.



business_licenses.csv

Extract the first 3 characters in the Postal Code

Set Conditional Value for FeePaid: **IF FeePaid Attribute_Is_Empty set to 0**

Create new attribute called: **BusinessDisplayName**
Set Conditional Value for BusinessDisplayName: **IF BusinessTradeName HAS VALUE set to BusinessTradeName ELSE set to BusinessName**

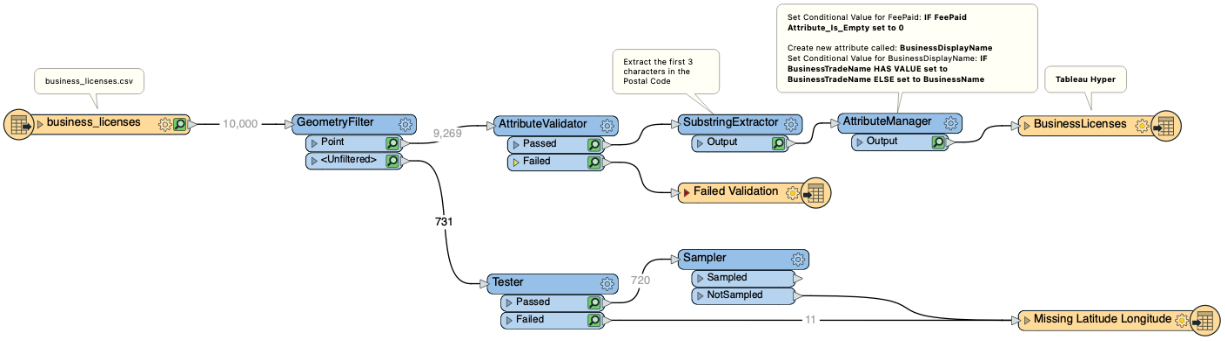
Tableau Hyper

Once configured, you can click on the Tester and do a partial run up to the Tester to update the feature caches.

9. Sample features to Geocode

In a real world scenario, you would skip this step. However, since we don't have time to wait for 720 features to be geocoded, we will use a Sampler to allow 5 features to be sent into the geocoder.

Add a Sampler after the Tester and connect it to the passed port. In the Sampler parameters, set the **Sampling Rate to 5** and the **Sampling Type to First N Features**.



business_licenses.csv

Extract the first 3 characters in the Postal Code

Set Conditional Value for FeePaid: **IF FeePaid Attribute_Is_Empty set to 0**

Create new attribute called: **BusinessDisplayName**
Set Conditional Value for BusinessDisplayName: **IF BusinessTradeName HAS VALUE set to BusinessTradeName ELSE set to BusinessName**

Tableau Hyper

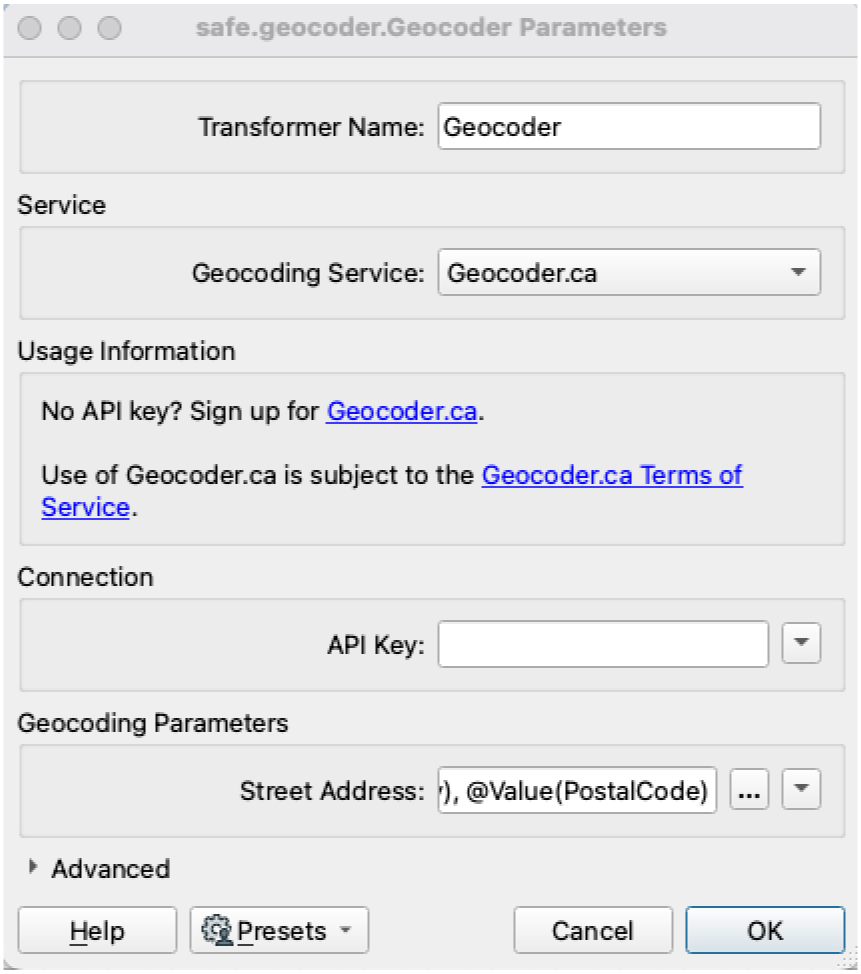
10. Geocode and connect to the Hyper Writer

A Geocoder uses various external web services to convert addresses to latitude/longitude coordinates and vice versa. Since we have address information, we will be forward geocoding in order to obtain the latitude and longitude and create a point feature.

Add a Geocoder after the Sampler and connect it to the Sampled Port to geocode the 5 features. In the Geocoder parameters, set the **Geocoding service to geocoder.ca** and use the following expression to set the Street Address.

$$@Value(House)\ @Value(Street),\ @Value(City),\ @Value(Country),\ @Value(PostalCode)$$

Since we are only geocoding a handful of features, we do not have to specify an API key.



safe.geocoder.Geocoder Parameters

Transformer Name: Geocoder

Service

Geocoding Service: Geocoder.ca

Usage Information

No API key? Sign up for Geocoder.ca.

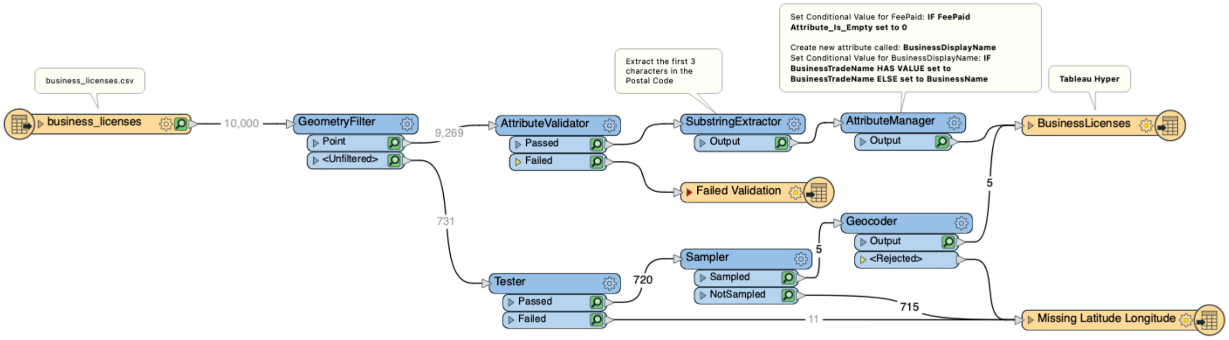
Use of Geocoder.ca is subject to the Geocoder.ca Terms of Service.

Connection

API Key:

Geocoding Parameters

Street Address:), @Value(PostalCode)



business_licenses.csv

Extract the first 3 characters in the Postal Code

Set Conditional Value for FeePaid: **IF FeePaid Attribute_Is_Empty set to 0**

Create new attribute called: **BusinessDisplayName**
Set Conditional Value for BusinessDisplayName: **IF BusinessTradeName HAS VALUE set to BusinessTradeName ELSE set to BusinessName**

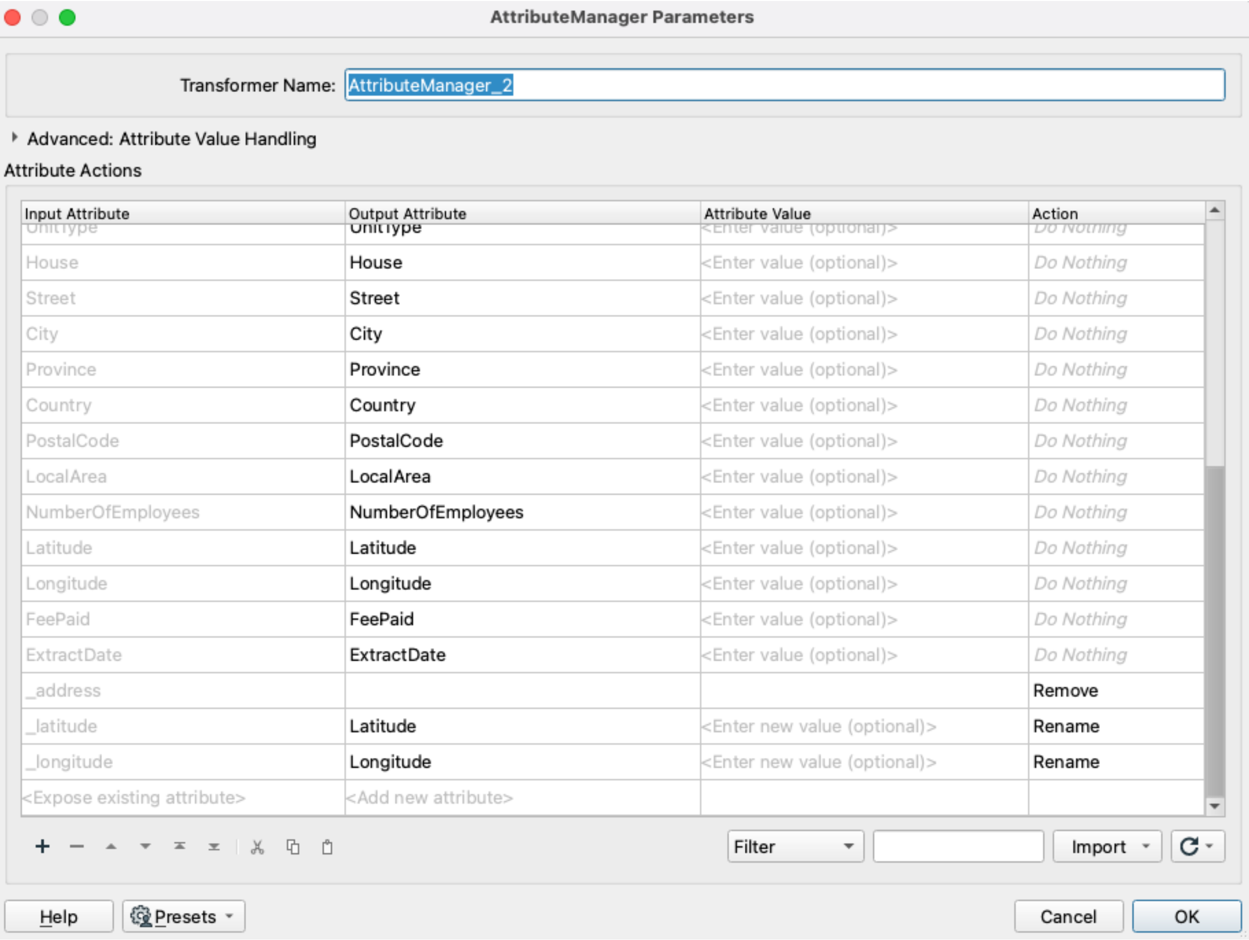
Tableau Hyper

11. Remove unwanted attributes from the Geocoder

In many cases, the features that are successfully returned by the Geocoder will contain additional attributes. In this case, 3 new attributes have been added (_address, _latitude, and _longitude).

Add an AttributeManager after the Geocoder to **remove the _address** attribute and rename the **_latitude to Latitude** AND **_longitude to Longitude** to match the desired output schema.

Lastly, connect the AttributeManager to the BusinessLicenses Writer FeatureType to complete the workspace.



AttributeManager Parameters

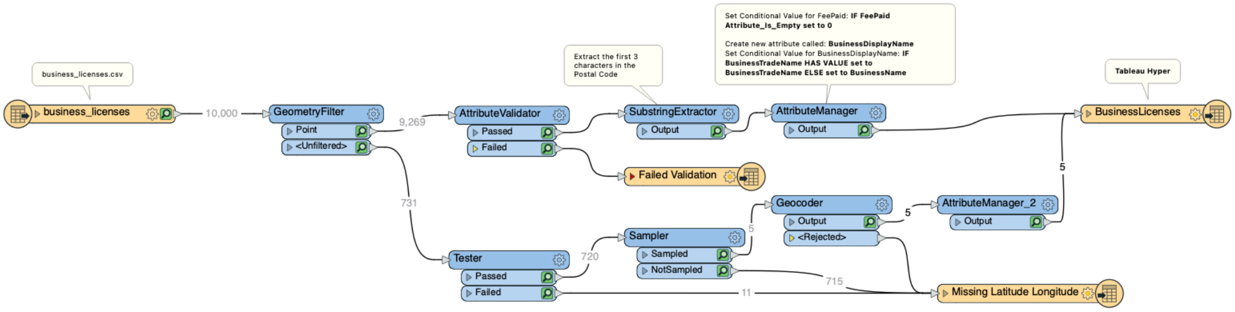
Transformer Name: AttributeManager_2

Advanced: Attribute Value Handling

Attribute Actions

Input Attribute	Output Attribute	Attribute Value	Action
UnitType	UnitType	<Enter value (optional)>	Do Nothing
House	House	<Enter value (optional)>	Do Nothing
Street	Street	<Enter value (optional)>	Do Nothing
City	City	<Enter value (optional)>	Do Nothing
Province	Province	<Enter value (optional)>	Do Nothing
Country	Country	<Enter value (optional)>	Do Nothing
PostalCode	PostalCode	<Enter value (optional)>	Do Nothing
LocalArea	LocalArea	<Enter value (optional)>	Do Nothing
NumberOfEmployees	NumberOfEmployees	<Enter value (optional)>	Do Nothing
Latitude	Latitude	<Enter value (optional)>	Do Nothing
Longitude	Longitude	<Enter value (optional)>	Do Nothing
FeePaid	FeePaid	<Enter value (optional)>	Do Nothing
ExtractDate	ExtractDate	<Enter value (optional)>	Do Nothing
_address			Remove
_latitude	Latitude	<Enter new value (optional)>	Rename
_longitude	Longitude	<Enter new value (optional)>	Rename
<Expose existing attribute>	<Add new attribute>		

Your workspace should look like similar to the image below:



business_licenses.csv

Extract the first 3 characters in the Postal Code

Set Conditional Value for FeePaid: **IF FeePaid Attribute_Is_Empty set to 0**

Create new attribute called: **BusinessDisplayName**
Set Conditional Value for BusinessDisplayName: **IF BusinessTradeName HAS VALUE set to BusinessTradeName ELSE set to BusinessName**

Tableau Hyper

12. Modify writer feature type properties

Since we defined an Automatic attribute definition, the schema on our Writer Feature Type has been automatically set based on the incoming connections to the Feature Type. If you want to update data types, re-order, or set any indexing rules you can do so by changing the attribute definition to Manual in the Writer Feature Type Parameters on the User Attributes tab.

Since we are creating a new Tableau Hyper file, we can leave the Table Handling as Create if needed.

13. Run workspace and confirm .hyper file exists

Let's run our final workspace! Click on the Run button and the output will automatically open in the Visual Preview window.

If you wish to create the actual files, you can disable the Redirect to FME Data Inspector setting in the Writers menu. If you have disabled it, run the workspace and confirm the .hyper file and DataCleanup.xlsx files were created using Windows Explorer.

In this exercise, you learned how to 1) filter by geometry type, data type, and attribute values, 2) extract portions of text using string indices (though you can also extract text with REGEX and other techniques as well), 3) geocode addresses, and 4) perform schema changes like adding, renaming, re-ordering and how to update data types.

In the next exercise, we will look at creating a few ways you can build density maps with FME for Tableau.