FME UC: Working with 3D Geometry

Course Title	Working with 3D Geometry
Product Type	FME Desktop
FME Version	2022.0

Description

Want to effectively work with 3D data in FME? Learn the fundamentals about different representations of 3D data within FME, common workflows and explore underlying transformations. Learn how to add to and manipulate the appearance of 3D data using transformers such as the AppearanceExtractor and the AppearanceSetter.

Content Overview

1. Adding a Texture to a TIN Surface
2. Creating a Geometry Instance
3. 3D Clipping

Prerequisites

Basic familiarity with FME Desktop, at least to the extent covered by the Getting Started with FME Desktop tutorial, or Integrate Data with the FME Platform.

Step-by-Step Instructions

You'll find starting workspaces for each exercise below in C:/FMEData2022/Resources/Working With 3D Geometry/Data/…

Exercise 1: Adding a Texture to a TIN Surface

Part 1: Using an AppearanceSetter

In this exercise, we will add a texture from an orthophoto (INGR) onto a surface (FFS).

1. Open AddTexture_1.fmw

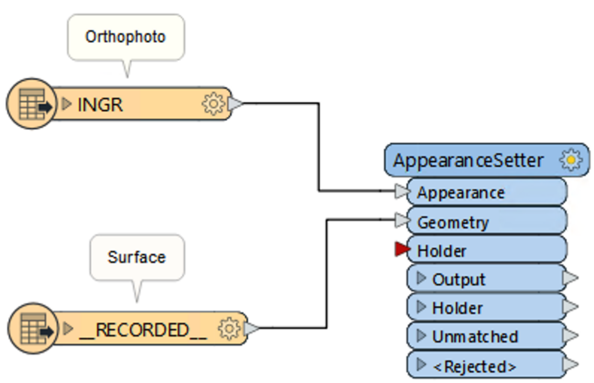
Ensure in the Navigator that the source data path is pointing at the right place or the datasets. If it you see a red cog on the path dataset, point it to the paths below for each reader:

Reader Format - Description	**Dataset Path**
Feature File Store (FFS) - Surface	C:/FMEData2022/Resources/Working With 3D Geometry/Data/Molokai.ffs
Intergraph Raster (INGR) - Orthophoto	C:/FMEData2022/Resources/Working With 3D Geometry/Data/landsat_molokai-lanai_n83.jpg

Hit the green 'play' button to Run the workspace. You can now inspect the data in the Visual Previewer.

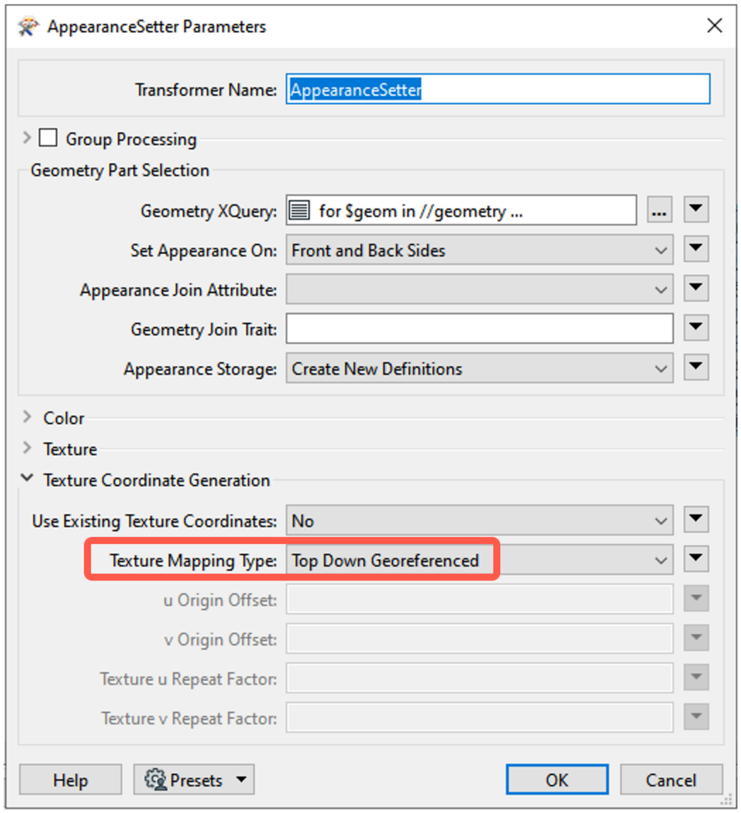
2. Add an AppearanceSetter

Start typing Appearance into the canvas to bring up the AppearanceSetter. Add it to the canvas and connect the INGR reader feature type (annotated as Orthophoto) to the *Appearance* input port, and the FFS feature type (annotated as Surface), to the *Geometry* input port.



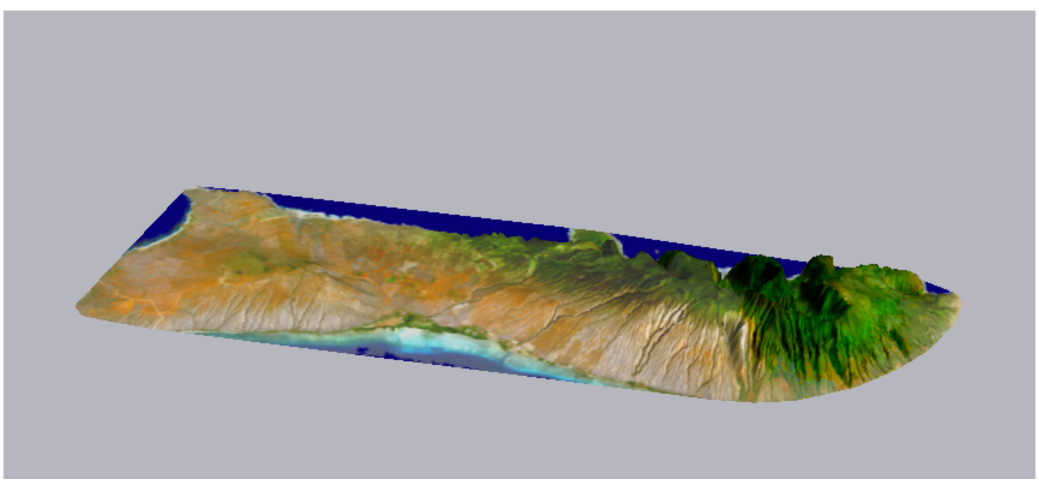
3. Configure the AppearanceSetter

Open up the AppearanceSetter by double-clicking on it or selecting the gear icon on the top right. Expand *Texture Coordinate Generation*, and set *Texture Mapping Type* to *'Top Down Georeferenced'.*



4. Run the workspace

In the Visual Previewer, you'll be able to inspect the output which will look something like this:



You may save the workspace if you wish, but it is not necessary.

Part 2: Set a Repeating Texture Size

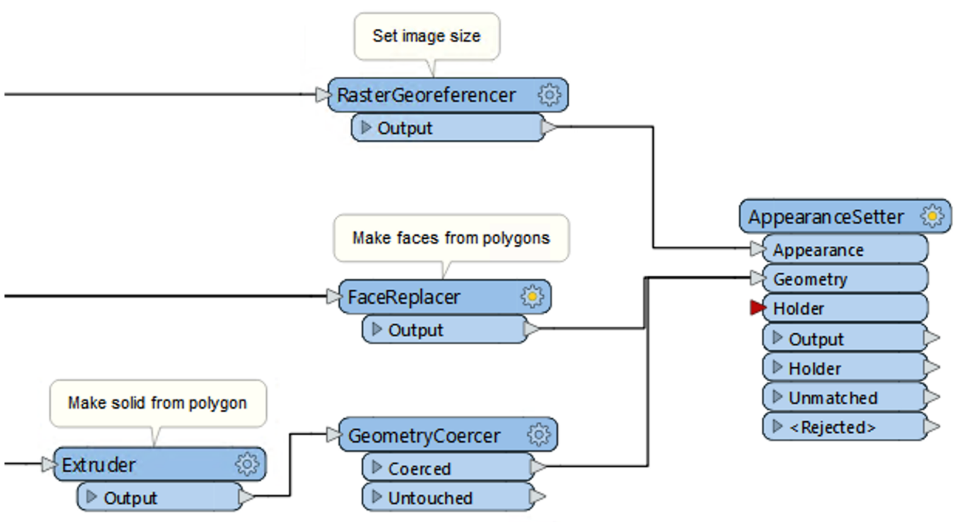
Now that you know how to use the AppearanceSetter, we'll cover a few different geometries with a brick texture. In this exercise we have Creators to create two sizes of polygons and one extruded box, as well as a JPEG image of a brick pattern for texture as our source data.

1. Open AddTexture_2.fmw

Ensure that the JPEG reader data path points to C:/FMEData2022/Resources/Working With 3D Geometry/Data/brick.jpg if you see a red cog in the Navigator. Run the workspace so far to inspect the feature caches.

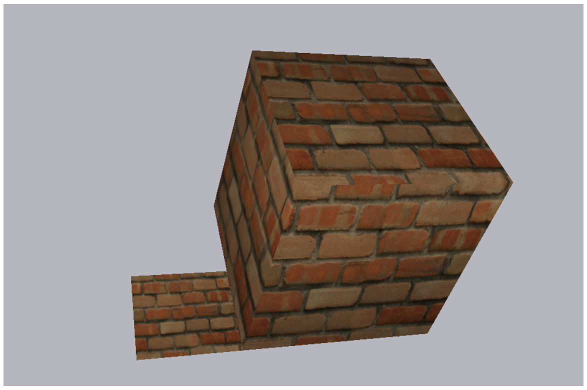
2. Add an AppearanceSetter

Add an AppearanceSetter and connect the RasterGeoreferencer to the *Appearance* input port of the AppearanceSetter. Connect the output from the FaceReplacer to the *Geometry* port, and also connect the GeometryCoercer output to the *Geometry* input port.



3. Run workspace to view the output.

Below is an example of the output you should get from the Output port of the AppearanceSetter.



Exercise 2: Creating a Geometry Instance

A geometry definition is a shared geometry that can have several geometry instances in the same or different features. Geometry instances are useful for complex geometries where many copies of the same object are required.

In this exercise we will create a geometry instance, and then update it with a different SketchUp model.

Part 1: Create a Geometry Instance

This first part is a demonstration. Please open MakeInstance.fmw if you'd like to follow along on your own computer. This workspace creates the Streetlight_instance.skp that will be used as a source dataset in Part 2.

Part 2: Update a Geometry Instance

One of the benefits of using geometry instances is that you only need to replace the instance model rather than replace every individual model. Here we will update the geometry instance to a new pole model.

If you are having trouble with your workspace at any point, please feel free to open up *UpdateInstance_final.fmw* at any point to use for reference or just to explore the workspace.

1. Open UpdateInstance_initial.fmw

Check that the SketchUP (SKP) readers are pointing to each of the files:

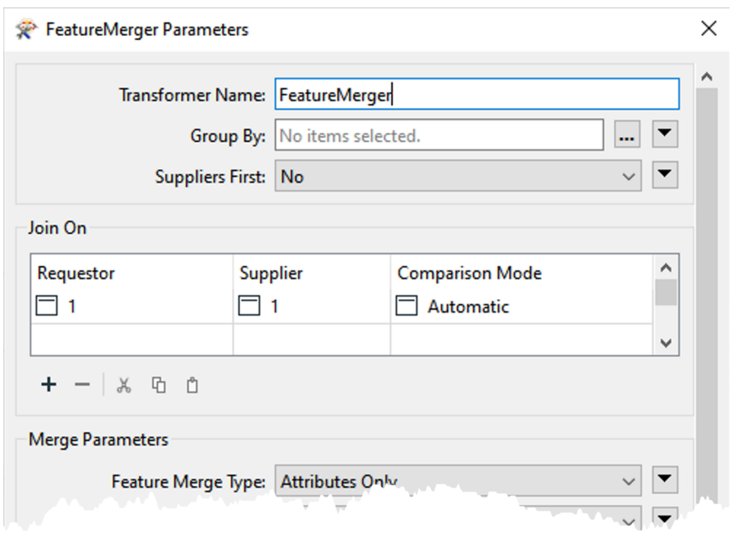
C:/FMEData2022/Resources/Working with 3D Geometry/Output/Streetlight_instance.skp
C:/FMEData2022/Resources/Working with 3D Geometry\Data\Custom-Decorative-Pendant.skp

2. Use a SharedItemAdder to add a new pole to the library

Add a SharedItemAdder and connect it to the junction coming out of the bookmark. In the SharedItemAdder, set *Item to Add* to ‘*Geometry Definition’,* and *Insert Mode* to ‘*Add New Item’.*

3. Merge the new pole shared_item_id onto the existing model

Add a FeatureMerger transformer and connect the junction from the existing SketchUp Streetlight_instance to the *Requester* port. Connect the output of the SharedItemAdder to the *Supplier* port of the FeatureMerger. In the FeatureMerger parameters, type in a 1 for Requester and a 1 for Supplier and press OK.

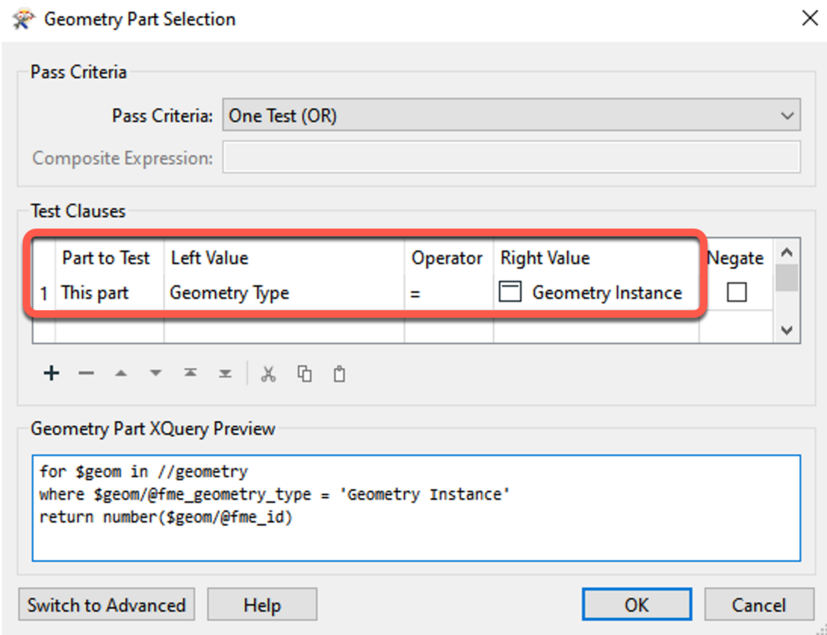


4. Add a SharedItemIDSetter to update the ID to a new pole

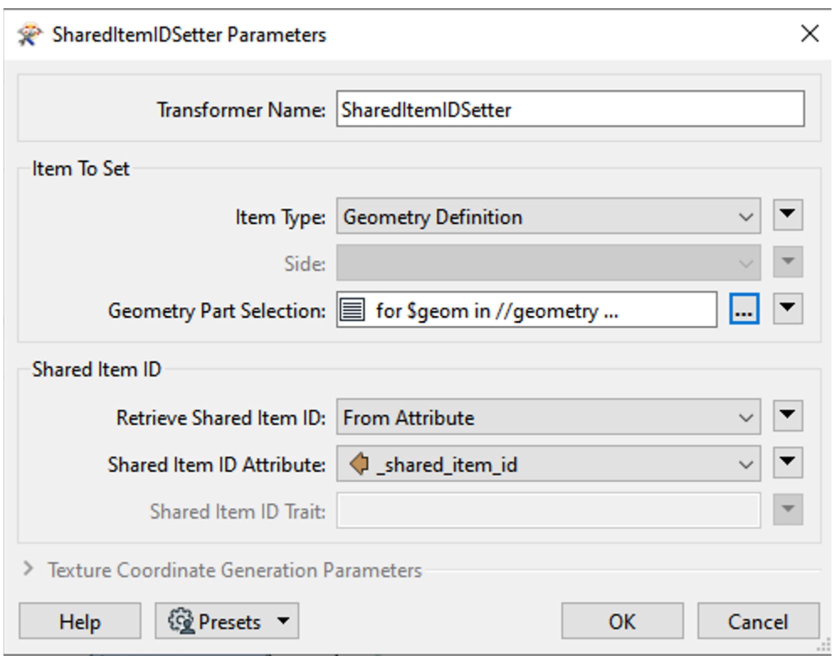
Connect a SharedItemIDSetter to the output port of the FeatureMerger. Open the transformer parameters and set:

- *Item Type: ‘Geometry Definition’*
- *Geometry Part Selection: This Part Geometry Type = Geometry Instance*
- *Retrieve Shared Item ID: From Attribute*
- *Shared Item ID Attribute: (select from drop-down) _shared_item_id*

For the Geometry Part Selection, you only need to fill the Test Clauses like below:



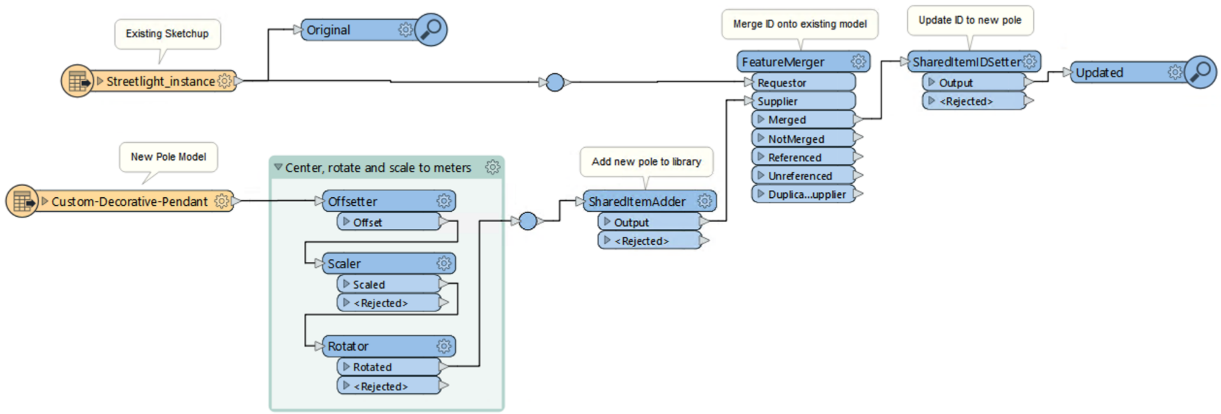
The completed SharedItemSetter parameters will look like this:



Right-click to add an Inspector and run the workspace

5. Connect the Updated Inspector

Connect the SharedItemIDSetter Output port to the Updated Inspector, then Run the workspace. Your completed workspace should look like this:



Congratulations! You have now updated the existing streetlight instance to a new model.

Exercise 3: 3D Clipping

FME 2022 introduced a new and improved Clipper with more capabilities in 3D Clipping. Here we will clip a shapefile of polygons spelling out ‘FME’ from a Triangulated Irregular Network (TIN) surface created from a source Lidar LAS file.

1. Open 3DClipping.fmw

As a good habit, check that the source data path is connected to FME.shp and USGS_DEM.las. Run the workspace to check out your source data.

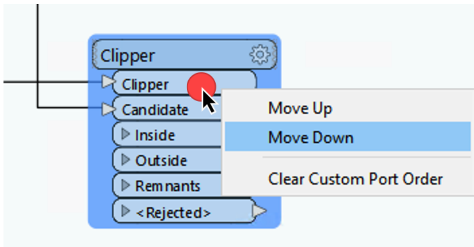
2. Add a Clipper

Add a Clipper to the canvas and connect the *TINSurface* output port from the TINGenerator to the *Candidate* port of the Clipper. Connect the FME Clipping shape SHP file to the *Clipper* port of the Clipper.

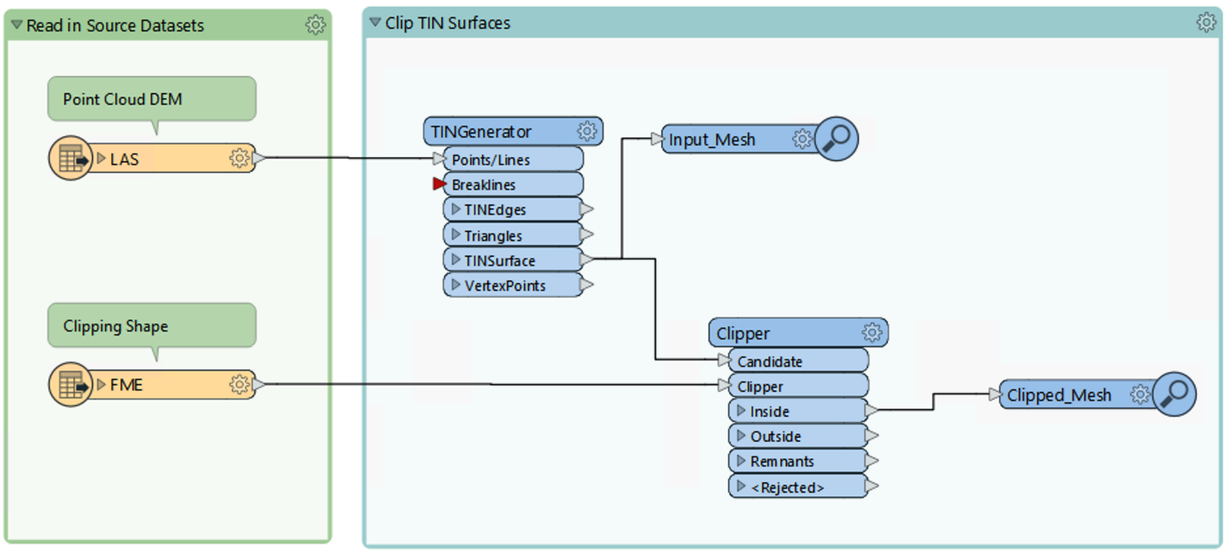
3. Connect to the Clipped_Mesh Inspector

Connect the Clipper Inside output port to the Clipped_Mesh Inspector, then Run the workspace.

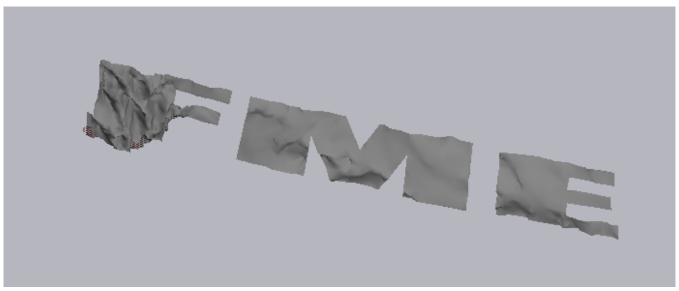
Pro tip: Don’t like your connections crossing? We don’t either! Right-click on the Clipper ports to *Move Up* or *Move Down.*



Your workspace should look something like this:



Can you spot which output features are *inside* and which are *outside*?



Great job! You've completed the 3D Clipping tutorial!

Additional Resources

- Tutorial: Creating and Using Geometry Instances
- Tutorial: Adding Different Textures to a 3D City Model
- Tutorial: Draping Imagery Textures on Terrain Surfaces
- Tutorial: How to Clip TIN Surfaces
- Webinar: Clip, Clip, Hooray! Get Just the Data You Need with Clipping
- Webinar: FME Hocus Pocus: 3D Transformation - Review 3D geometries

Data Attribution

Data used in this course are available to the public domain and are made available by the sources below:

- Government of Austin, Texas - LAS DEM

- Sketchup 3D Warehouse - Geometry instances
- Hawaiian Statewide GIS Open Geospatial Data Portal - Lanai and Molokai data
- National Centers for Environmental Information - World DEM