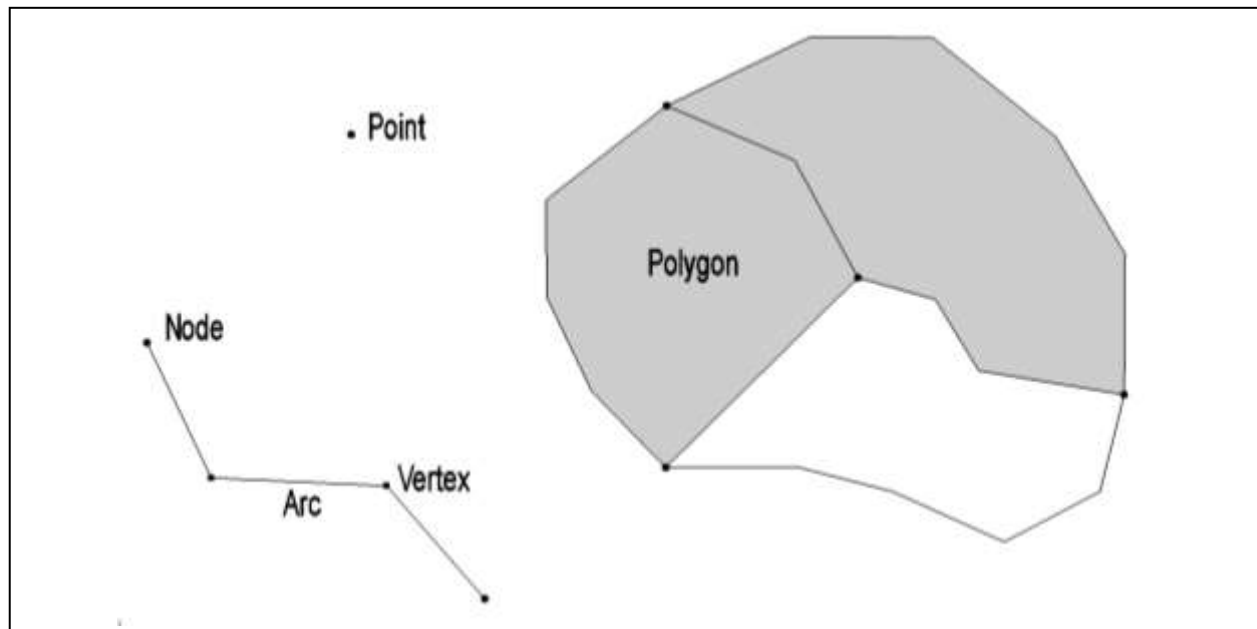


GMS 10.0 Tutorial Feature Objects

Use points, arcs, and polygons to make grid independent conceptual models



Objectives

This tutorial demonstrates how to use feature objects—points, arcs, and polygons—to make grid independent conceptual models.

Prerequisite Tutorials

- None

Required Components

- Map

Time

- 8-15 minutes



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1 Introduction

This tutorial gives an introduction to feature objects. Feature objects are basic objects used in numerous ways in GMS.

1.1 Outline

This is what the tutorial will illustrate:

1. How to create coverages
2. How to create conceptual models
3. How to create feature objects
4. How to select and modify feature objects

2 Getting Started

To get started, follow the next steps.

1. If necessary, launch GMS.
2. If GMS is already running, select the *File / New* command to ensure that the program settings are restored to their default state.

3 Feature Objects

Feature objects have been patterned after Geographic Information Systems (GIS) objects and include points, nodes, arcs, and polygons (Figure 1). Feature objects can be used in many ways in GMS, and they are used in several tutorials.

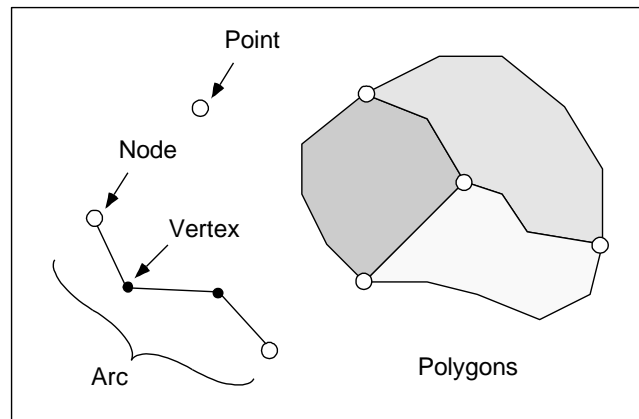


Figure 1 Feature objects

3.1 Points

Points are xy locations that are not attached to an arc. Points have unique IDs and can be assigned properties. Points are typically used to represent wells.

3.2 Arcs

Arcs are sequences of line segments or edges that are grouped together as a single polyline entity. Arcs have unique IDs and can be assigned properties.

3.3 Nodes and Vertices

The two end points of an arc are called “nodes” and the intermediate points are called vertices. Nodes have unique IDs and can be assigned properties. Vertices are used solely to define the geometry of the arc. Vertices cannot be assigned properties.

3.4 Polygons

Polygons are a group of connected arcs that form a closed loop. A polygon can consist of a single arc or multiple arcs. If two polygons are adjacent, the arc(s) forming the boundary between the polygons is shared (not duplicated).

3.5 Coverages

Feature objects are grouped into coverages. Each coverage represents a particular set of objects and the attributes associated with those objects.

3.6 Coverages and Conceptual Models

Both coverages and conceptual models require certain steps to be created.

Coverages

Follow the steps below to create a coverage.

1. In the Project Explorer, right-click and select the *New / Coverage* command. The *Coverage Setup* dialog will appear.
2. Click **OK** to exit the *Coverage Setup* dialog.

The *new coverage* item is now the active coverage, meaning that when the user creates feature objects, they will be added to this coverage.

3. In the Project Explorer, right-click on the *new coverage* and select the **Duplicate** command from the menu.

Coverages can be duplicated. All the feature objects and attributes from the original coverage are copied to the new coverage. Notice that the icon next to *new coverage* is now grey indicating that *new coverage* is no longer the active coverage.

4. Right-click on the “Copy of new coverage” coverage and select the **Delete** command from the menu. That coverage will now disappear.

Conceptual Models

A conceptual model in GMS is an object that can be used to associate one or more related coverages.

1. Right-click in the Project Explorer and select the *New / Conceptual Model* command from the menu. This will bring up the *Conceptual Model Properties* dialog.

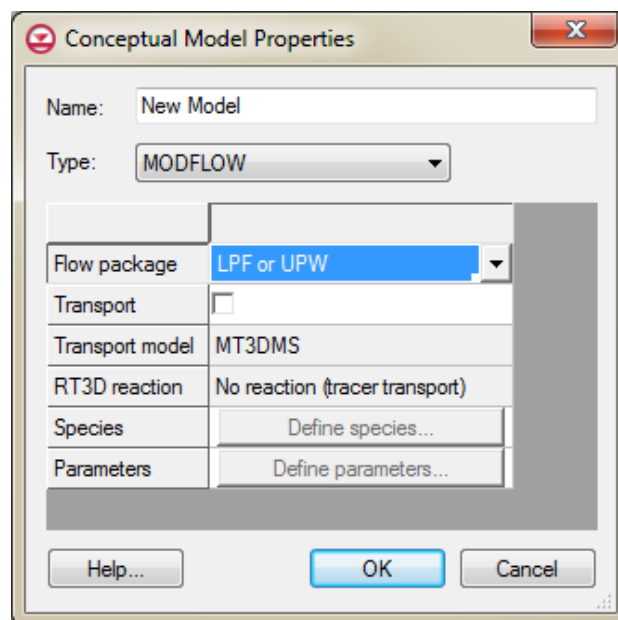


Figure 2 The Conceptual Model Properties dialog

Notice that conceptual models have a name and a type. The type corresponds with the type of model being created (MODFLOW, FEMWATER, etc.). The type determines what other options are available in the spreadsheet.

2. Click **OK** to exit the *Conceptual Model Properties* dialog.
3. In the Project Explorer field, select and drag the “new coverage” below the “New Model” conceptual model.
4. Click **Yes** regarding the warning about attributes.



The attributes in a coverage depend on the settings in the conceptual model that the coverage is associated with. The coverage should now be below the conceptual model.



Figure 3 The Project Explorer showing a new coverage below a conceptual model

3.7 Creating Feature Objects

Now to create some feature objects.

1. Switch to the **Create Point**  tool.
2. Click with the mouse to create points in any location in the graphics window.
3. Switch to the **Create Arc**  tool.
4. Create several arcs by clicking with the mouse. Single-click to create arc vertices and double-click to end the arc.

Polygons must be created using the *Feature Objects* / **Build Polygons** menu command. Although the user may have created a closed loop with one or more arcs, the program won't recognize a polygon until the user selects the *Feature Objects* / **Build Polygons** menu command.

5. Create some polygons by creating closed loops with one or more arcs.
6. Select the *Feature Objects* / **Build Polygons** menu command.

The polygons will now exist where the user created the closed loop of arcs. Until the **Build Polygons** command is used, the file won't have polygons—only arcs. Feel free to experiment with the other feature object tools.

3.8 Selecting Feature Objects

There are different tools for creating feature objects and selecting feature objects. Refer to Figure 4 below. The different selection tools select different types of objects.

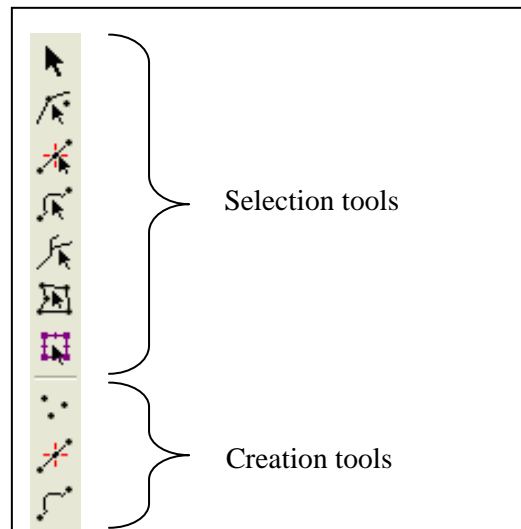


Figure 4 Feature object tools

1. Hold the mouse cursor over a tool for a couple of seconds until the tool name appears as shown in Figure 5.

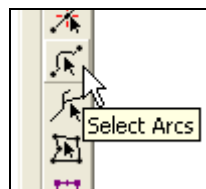




Figure 5 Context sensitive help for tools

The **Select**  tool can be used to select all different types of feature objects. The other tools can only select one specific type of object. The **Select** tool will probably be used most often, but the other tools can be used when necessary, such as when different types of objects are close to each other.

2. Use the **Select**  tool to select different types of feature objects.
3. Try out the other selection tools. Select different objects.



3.9 Modifying Feature Objects

There are several ways that feature objects can be modified using GMS.




Dragging Objects

Some feature objects, like points and vertices, can be moved to other locations by dragging them with the mouse. Other objects, like arcs and polygons, cannot be dragged, but it's possible to move arcs and polygons by moving the nodes and vertices that are on them.

Points and Nodes


1. Use the **Select Points/Nodes**  tool to select one of the isolated points created earlier.
2. While holding down the left mouse button, drag the point to a different location.
3. Use the same **Select Points/Nodes**  tool to drag a node on the arc created earlier.

Vertices

1. Select the **Display Options**  button.
2. Make sure the *Map Data*  item in the list on the left is highlighted and the *Map* tab on the right is visible.
3. Turn on the *Vertices* option and click **OK**.
4. Switch to the **Select Vertex**  tool.
5. Select and drag a vertex on one of the arcs created earlier.

Adding and Removing Vertices

Arcs can be modified by adding more vertices.

1. Switch to the **Create Vertex**  tool.
2. Click on one of the arcs that were created earlier to add vertices to it.


By adding vertices and dragging them where they are needed, the user can refine how the arc looks. It is also possible to right-click on an arc and redistribute the vertices; this is a faster way to create many vertices.

3.10 Grid Frames

Grid frames are used to build 2D and 3D grids. A grid frame defines the rectangular extent of the grid. Grid frames can be rotated and moved to better fit the desired modeling area.

1. Select the *Feature Objects* / **New Grid Frame** menu command.

This creates a grid frame. A purple rectangle should now appear on the screen.

2. Switch to the **Select Grid Frame**  tool.
3. Click on one of the lines of the grid frame to select it.
4. Now click on the interior of the grid frame to drag it to a new location.

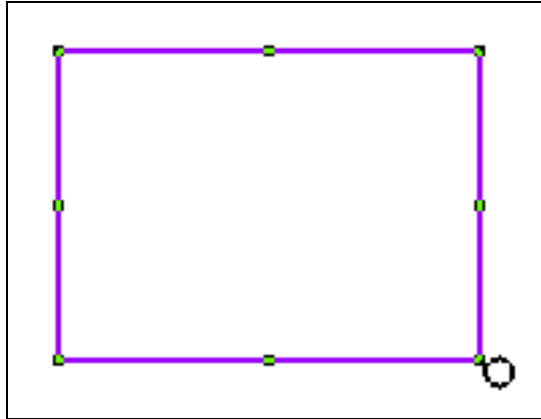


Figure 4 Grid frame with handles

Notice the handles in the corners and the middle of the edges of the grid frame. In the bottom right corner, notice the circular handle used for rotation.

5. Click on the handles of the grid frame to resize it and on the circular handle to rotate it.

The properties of the grid frame can also be entered manually by double-clicking on the grid frame in the Project Explorer and editing the items in the *Grid Frame Properties* dialog.

4 Conclusion

This concludes the tutorial. Here are the things that the user should have learned in this tutorial:

- How to create coverages
- How to create conceptual models
- How to create feature objects
- How to select and modify feature objects