

Mesh file format version 2.0

The mesh file format comes from the GMSH system. Following text is copied from the GMSH documentation.

===== BEGIN OF INSERTED TEXT =====

Version 2.0 of the .MSH file format is Gmsh's new native mesh file format. It is very similar to the old one (Version 1.0), but is more general: it contains information about itself and allows to associate an arbitrary number of integer tags with each element.

The .MSH file format, version 2.0, is divided in three sections, defining the file format (**\$MeshFormat-\$EndMeshFormat**), the nodes (**\$Nodes-\$EndNodes**) and the elements (**\$Elements-\$EndElements**) in the mesh:

```
$MeshFormat  
2.0 file-type data-size  
$EndMeshFormat  
$Nodes  
number-of-nodes  
node-number x-coord y-coord z-coord  
...  
$EndNodes  
$Elements  
number-of-elements  
elm-number elm-type number-of-tags <tags> node-number-list  
...  
$EndElements
```

where:

file-type is an integer equal to 0 in the ASCII file format.

data-size is an integer equal to the size of the floating point numbers used in the file (usually, *data-size* = sizeof(double)).

number-of-nodes is the number of nodes in the mesh.

node-number is the number (index) of the n -th node in the mesh. Note that the *node-numbers* do not have to be given in a consecutive (or even an ordered) way.

x-coord y-coord z-coord are the floating point values giving the X, Y and Z coordinates of the n -th node.

number-of-elements is the number of elements in the mesh.

elm-number is the number (index) of the n -th element in the mesh. Note that the *elm-numbers* do not have to be given in a consecutive (or even an ordered) way.

elm-type defines the geometrical type of the n -th element:

- 1 Line (2 nodes)
- 2 Triangle (3 nodes)
- 3 Quadrangle (4 nodes)
- 4 Tetrahedron (4 nodes)
- 5 Hexahedron (8 nodes)
- 6 Prism (6 nodes)
- 7 Pyramid (5 nodes)
- 8 Second order line (3 nodes)
- 9 Second order triangle (6 nodes)
- 11 Second order tetrahedron (10 nodes)
- 15 Point (1 node)

number-of-tags gives the number of tags for the n -th element. By default, Gmsh generates meshes with two tags and reads files with an arbitrary number of tags: see below.

tag is an integer tag associated with the n -th element. By default, the first tag is the number of the physical entity to which the element belongs; the second is the number of the elementary geometrical entity to which the element belongs; the third is the number of a mesh partition to which the element belongs.

node-number-list is the list of the node numbers of the n -th element (separated by white space, without commas). The ordering of the nodes is given in Gmsh node ordering; for second order elements, the first order nodes are given first, followed by the nodes associated with the edges,

followed by the nodes associated with the faces (if any). The ordering of these additional nodes follows the ordering of the edges/faces given in Gmsh node ordering.

===== END OF INSERTED TEXT =====

More information about GMSH can be found at its homepage:
<http://www.geuz.org/gmsh/>

Comments concerning 1-2-3-FLOW:

- Every inconsistency of the file stops the calculation. These are:
 - Existence of nodes with the same *node-number*.
 - Existence of elements with the same *elm-number*.
 - Reference to non-existing node.
 - Reference to non-existing material (see below).
 - Difference between *number-of-nodes* and actual number of lines in nodes' section.
 - Difference between *number-of-elements* and actual number of lines in elements' section.
- By default 1-2-3-FLOW uses meshes with *number-of-tags* = 2.
 - tag1* is number of region in which the element lies.
 - tag2* is number of material (reference to `.MTR` file) in the element.
- Currently, line (*type* = 1), triangle (*type* = 2) and tetrahedron (*type* = 4) are the only supported types of elements. Existence of an element of different type stops the calculation.
- Wherever possible, we use the file extension `.MSH`. It is not required, but highly recommended.