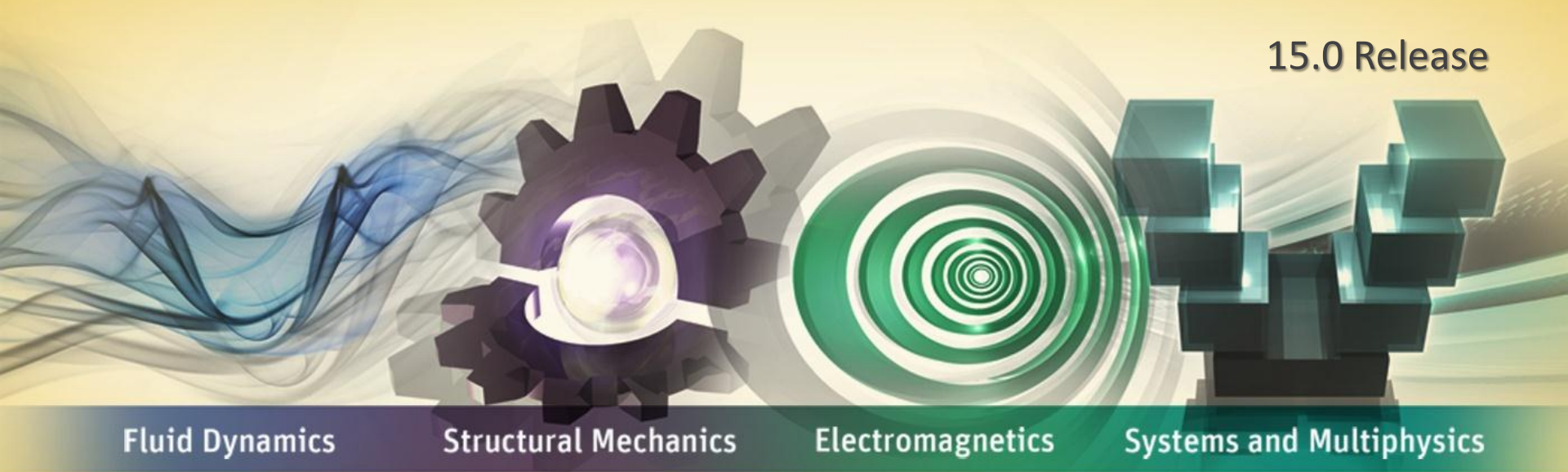


Appendix 6

Additional Edit Mesh Tools

15.0 Release

A horizontal banner with a yellow background. It features four distinct 3D visualizations: blue fluid flow lines, a purple gear with a glowing center, green concentric circles, and a stack of teal cubes. Below each visualization is a label in a dark bar.

Fluid Dynamics

Structural Mechanics

Electromagnetics

Systems and Multiphysics

Introduction to ANSYS ICEM CFD

Mesh Checks - Mesh Errors

Green worded checks have an automatic fix available in *Check/Fix each* mode

- **Duplicate Elements**
 - Elements that share all nodes with other elements of the same type
- **Uncovered Faces**
 - Volumetric element faces that are neither attached to the face of another volumetric element nor to a surface element (boundary face)
- **Missing Internal Faces**
 - Volumetric elements that are adjacent to another of a different part with no surface element between them
- **Periodic Problems**
 - Inconsistency in the pattern of nodes/faces between periodic sides
 - Special check for rotating (sector) or translational periodic grids
 - Select pairs of parts to check
- **Volume Orientation**
 - Left handed elements due to incorrect connectivity (node numbering of cell)
- **Surface Orientations**
 - Surface elements whose attached volume elements share part of the same space
- **Hanging Elements**
 - Line (bar) elements with a free node (node not shared by any other element)
- **Penetrating Elements**
 - Surface element(s) that intersect or penetrate through other surface elements
- **Disconnected Bar Elements**
 - Bar elements where both nodes are unattached to any other elements

Mesh Checks - Possible Problems

Green worded checks have an automatic fix available in *Check/Fix each* mode

- **Multiple Edges**
 - Surface elements with an edge that shares three or more elements
 - Can include legitimate T-junctions
- **Triangle Boxes**
 - Groups of 4 triangles that form a tetrahedron with no actual volume element inside
- **2 -Single Edges**
 - Surface element with 2 free edges (not shared by another surface element)
- **Single-Multiple Edges**
 - Surface element with both free and multiple edges
- **Stand-Alone Surface Mesh**
 - Surface elements that don't share a face with a volumetric element
- **Single Edges**
 - Surface elements with a free edge
 - Can include legitimate hanging baffles
 - 2D-only mesh boundaries are single
- **Delaunay Violation**
 - Tri elements with nodes that are within the circumsphere of adjacent tri elements
 - legacy quality criteria
- **Overlapping Elements**
 - Continuous set of surface elements that occupy the same surface area (surface mesh that folds on to itself within a small angle)
- **Non-manifold vertices** (limited auto-fix)
 - Vertices whose adjacent surface elements' outer edges don't form a closed loop
 - Typically found in tent-like structures where surface elements jump from one surface to another across a narrow gap or sharp angle
- **Unconnected Vertices**
 - Vertices that are not connected to any elements
 - Can always be deleted

Smooth Elements Globally ?

Quality

Smoothing iterations: 5

Up to value: 0.20

Criterion: Aspect ratio

Smooth Mesh Type

	Smooth	Freeze	Float
TETRA_4	☒	☐	☐

Smooth Parts/Subsets

Method: All parts

Refresh Histogram

Advanced Options

Laplace

☐ Laplace smoothing

Criterion

☒ Pure ☐ Edge length

☐ Residual on Surfaces

Residual: 0.5

☐ Residual in Volume

Residual: 0.05

☐ Not just worst 1%

☒ Allow node merging

☐ Allow refinement

☒ Group bad hex regions

☐ Ignore PrePoints

☐ Surface Fitting

Prism Warpage Ratio: 0.5

☐ Violate geometry

Tolerance: 0.1

☐ Relative Tolerance

☐ Minimum Edge Length: 5

Apply OK Dismiss

• *Advanced Options*

– *Smooth Parts/Subsets*

- Smooth all parts, visible parts (activated in model tree), or visible subsets
- Quick, local smoothing

– *Laplace smoothing*

- Gives more uniform mesh size relative to neighboring elements and equal angles
- Recommended for TRI only – smooth Tetra after with Laplace turned off and tri's froze
- Recommended prior to prism generation

– *Not just worst 1%*

- Factors in all elements instead of only the worst 1% of those beneath quality value and their neighbors
- Can improve quality more but takes much longer

– *Violate geometry*

- Unconstrain nodes slightly from geometry within user defined tolerance – absolute or relative

– *Minimum Edge*

- Do not allow merging of any nodes that would make any edge smaller than this length