# Focus**On**

Showing Helpful and Unique Features in Gridgen®

# Gridgen is Solid

## Solid Meshing in Gridgen

Solid Meshing was introduced in Gridgen V15.09. It lets you take advantage of existing solid models imported from CAD files or create your own solid models directly in Gridgen to simplify the meshing process and reduce the amount of CAD cleanup you have to perform.

Solid meshing has several advantages over traditional surface-based meshing techniques:

1. There are fewer geometric entities to deal with. Instead of thousands of surfaces, you work with several high level model entities that represent logical pieces of your geometry. The underlying surfaces can be hidden so you do not need to worry about them.
2. Gaps, overlaps, and other flaws in the CAD geometry are automatically fixed. The solid model contains information about how all the underlying surfaces fit together to form a solid.
3. The grid topology can be defined as part of the geometry. You identify in the geometry where you want to have grid boundaries, thus explicitly controlling at the geometry level how the final grid will appear.
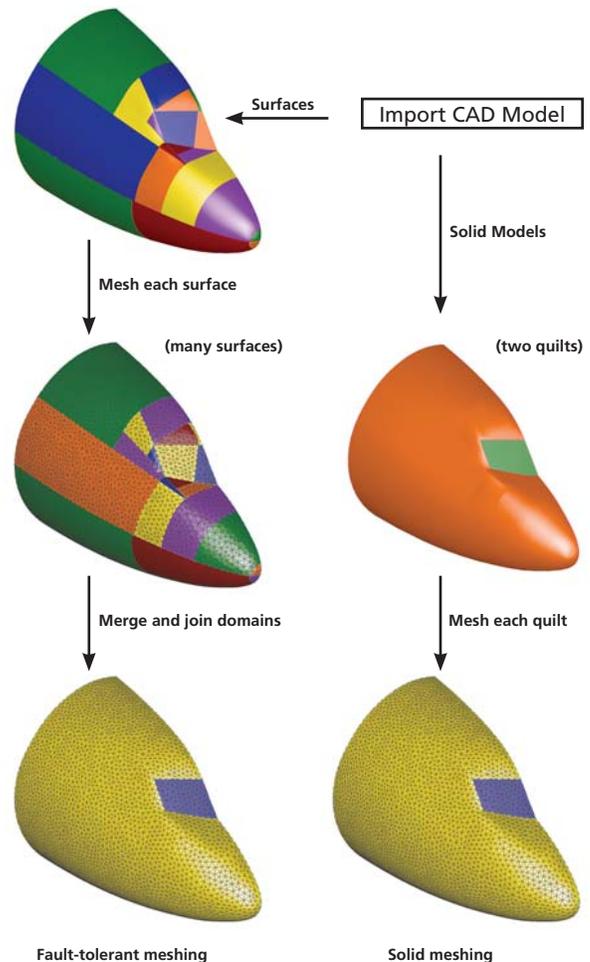
## Simplify CAD with Models and Quilts

Let's define a couple of new terms related to solid meshing:

A **model** is a logically connected set of surfaces. Models can form closed boundaries around a volume or they can be open.

A **quilt** is a subset of a model that defines a meshing region. In Gridgen terms, each quilt corresponds to a single domain. The edges of domains created using the On DB Entities command on quilts will correspond to the boundaries of the quilts, not the boundaries of the constituent surfaces.

If you want to compare this to Gridgen's fault-tolerant meshing approach, you can think of the model as taking care of the domain merging step and the quilt as taking care of the domain joining step in the On DB Entities command.

Even though solid meshing is similar to fault-tolerant meshing, it has some advantages. First, it works on the geometry, not on the



Surfaces

Import CAD Model

Mesh each surface

Solid Models

(many surfaces)

(two quilts)

Merge and join domains

Mesh each quilt

Fault-tolerant meshing

Solid meshing

grid, so you can try different meshing parameters without having to go through the joining and merging process again. Second, many CAD models these days already contain solid models, so the work of defining the model is already done for you. Third, it reduces the complexity of your CAD model, so you deal with several high level entities rather than thousands of individual surfaces and curves.

Of course, with Gridgen you can choose to use either or both approaches depending on the problem you are trying to solve.

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## What If I Do Not Have a Solid Model?

Even if your imported CAD geometry is not a solid model, you can still enjoy the benefits of solid meshing by assembling the solid model in Gridgen. Gridgen provides a graphical tool for building models and quilts with different tolerances. Once the model is built, you can save it in your database file or even export it as an IGES file for use in other software. After the model is defined or imported, you know that there are not any gaps or overlaps in it. For further control, you can define quilts in Gridgen. Quilts are database entities, but they define mesh regions. Individual CAD surfaces can belong to both models and quilts. When you pick a model to automatically grid, the quilts will define any internal grid boundaries, giving you greater control over grid topology and quality.

## Get the Best of Both Worlds

With Gridgen you now have two ways to mesh on CAD geometry: our traditional fault-tolerant meshing approach and the new solid meshing approach. Each approach has its advantages for particular classes of problems. Solid meshing will be much easier when your imported CAD already has solid models defined in it. Fault-tolerant meshing has the advantage when you do not have a complete geometry, since it does not require any CAD data at all to work.

Want to know more technical details about solid meshing? Then see AIAA paper AIAA-2005-5237, "Solid Modeling and Fault Tolerant Meshing." If you want to try solid meshing yourself, look for the `Model` and `Quilt` buttons in the Database Create menu. Visit www.pointwise.com/free to get a free evaluation copy to try for yourself.

imported surfaces → converted to solids in Gridgen
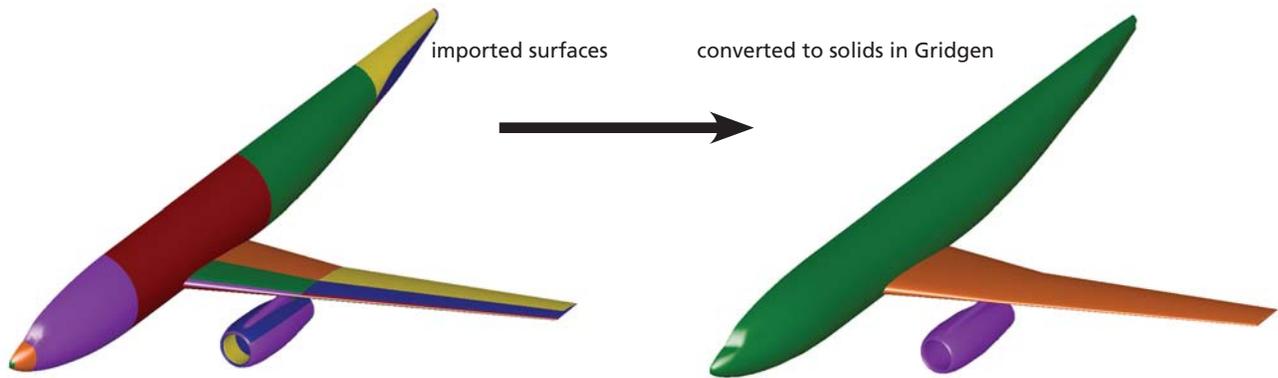
### Simplify your CAD models by defining solid models in Gridgen.

*Toll Free (888) GRIDGEN      www.pointwise.com*

**Gridgen**
Reliable CFD Meshing