

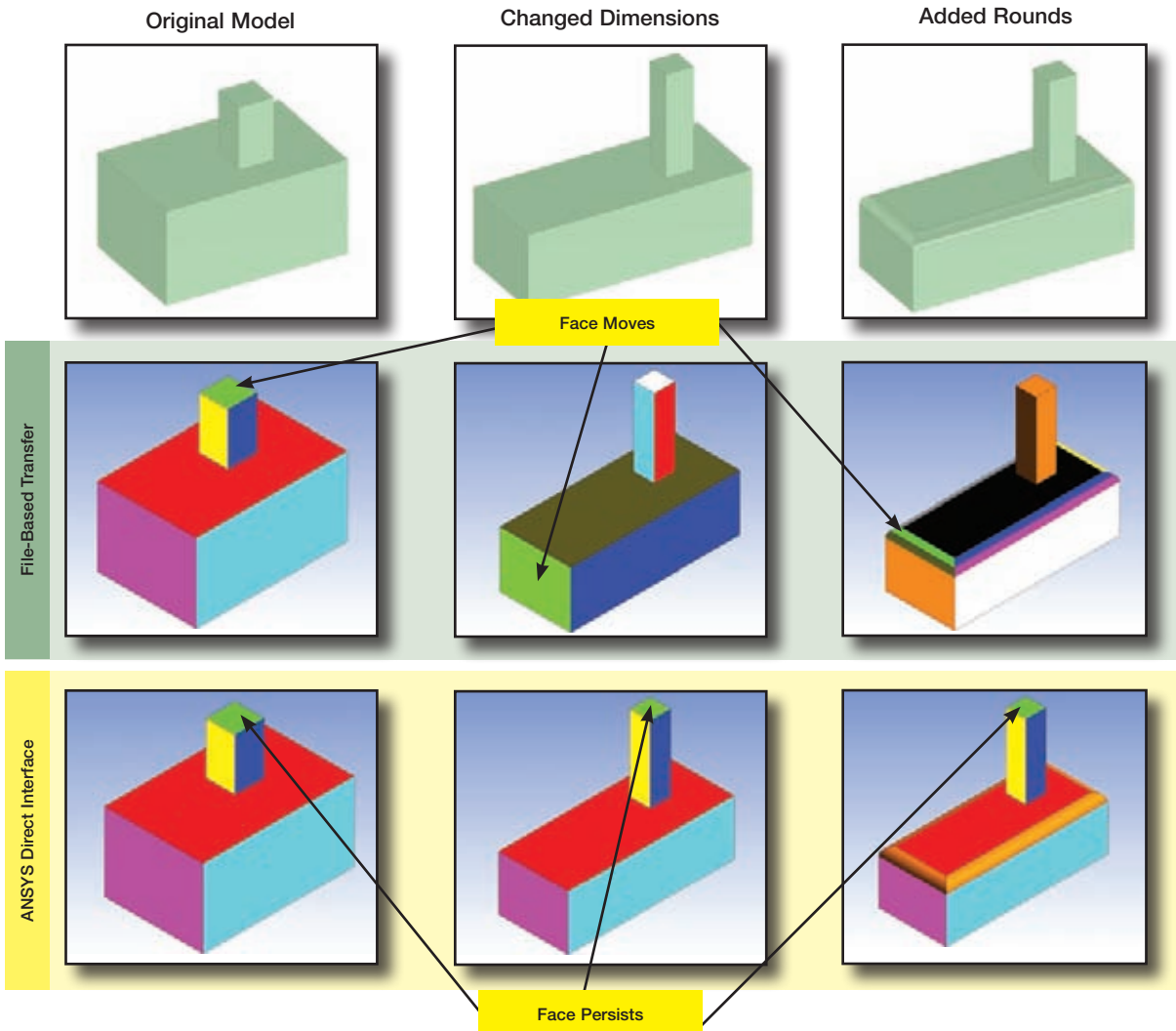
# Topology Persistence

Streamline the innovative design process using direct CAD interfaces.

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Many of those involved in engineering simulation feel that embedded CAD tools should be used for upfront simulation because they are tightly linked to the CAD model, whereas CAD-neutral systems, such as those employed in software from ANSYS, are better used downstream of the design process for validation. However, using the ANSYS direct CAD interfaces provides some benefits that CAD-embedded tools cannot offer.

ANSYS direct CAD interfaces do much more than import geometry. They allow access to the live geometry in a CAD system. The translation from native CAD to the ANSYS Workbench platform is performed through application programming interfaces (API) published by the CAD vendors. These APIs provide direct access to the live models (what you're working on now, not what is saved), which are transferred to ANSYS Workbench without any



Topology using ANSYS CAD interfaces is persistent and allows for process streamlining.

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additional intermediate files or translation. This process provides the most accurate and reliable geometry transfer possible.

APIs also allow software from ANSYS to access other information, such as parameters, attributes including named regions and material properties, and, most important, topology. Without topology, many of the advanced capabilities enabled through the ANSYS Workbench environment would not be nearly as useful.

Topology can be thought of as the names of places on a map: Countries are outlined, and each space is labeled with a country name. In the same manner, bodies, faces and edges in a 3-D model have names internal to the CAD system. This allows the system to locate regions consistently as changes are made to the model. What if someone gave you a map of the world with a separate list of country names? What if they gave you a map with the country names placed in the wrong locations? The map wouldn't be very useful. This is exactly what happens when geometry files are transferred using a neutral file format.

As an example, start with a simple file in a CAD system, export a STEP file, and then import the STEP file into the ANSYS Workbench platform. Within ANSYS Workbench, assign a unique color to each face of the model (for example, using a meshed body in CFD-Post). Return to the CAD system and change the geometry slightly. Export this new model as a STEP file and replace the original model in ANSYS Workbench, reusing the existing setup. When viewed in CFD-Post, the same internal faces remain (like the names of the countries in the map example), but their locations have all moved. Each face is now represented by a new color.

The same problem occurs when adding new features to the model, such as chamfered rounds on the edge of the box. New faces show as orange in the example, but, when using STEP transfer, previously existing faces are

now orange. If these colors were geometry operations, mesh controls, or loads and boundary conditions, then all locations would require updating; on a complicated model, it might be better to start from the beginning.

If the same procedure is followed using an ANSYS direct interface to transfer the geometry, all the faces retain their original color. Only the new rounds appear orange. New faces can still pose problems if they need to be selected or addressed in your analysis, but this is still much less work than having the new faces scrambled among the existing faces.

Because the software cannot understand what the geometry is, it relies on internal names to keep track of where to do things. If these internal names are lost or rearranged using file-based transfer, processes applied to the regions represented by these names will not be relevant.

ANSYS Workbench enables reuse of the analysis process when changes are made to geometry. This process applies to geometry operations in the ANSYS DesignModeler tool, mesh settings in ANSYS Mechanical and Meshing Platform, and loads and boundary conditions in the various simulation environments. With a direct CAD interface, geometry changes in the CAD system are simply updated through the entire ANSYS Workbench project. Geometry can be changed without the need to reapply these settings.

This topological persistence is also a key enabler for design exploration, in which ANSYS Workbench can automatically update the CAD model and rerun multiple analyses. Topological persistence reduces setup time for geometry modifications, so this time can be used to experiment with possible design changes, eliminate bad ideas quickly and highlight promising candidates — all with very little work up front. This reduces the variable cost of simulation and allows for design innovation — to provide value for you, your department and your company. ■