

Release 2023 R1 Highlights

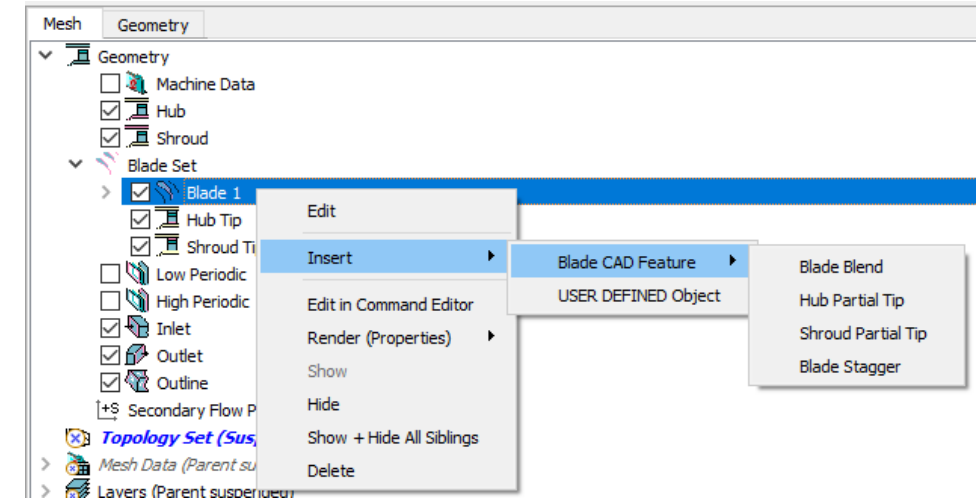
Ansys CFX and Turbo Tools



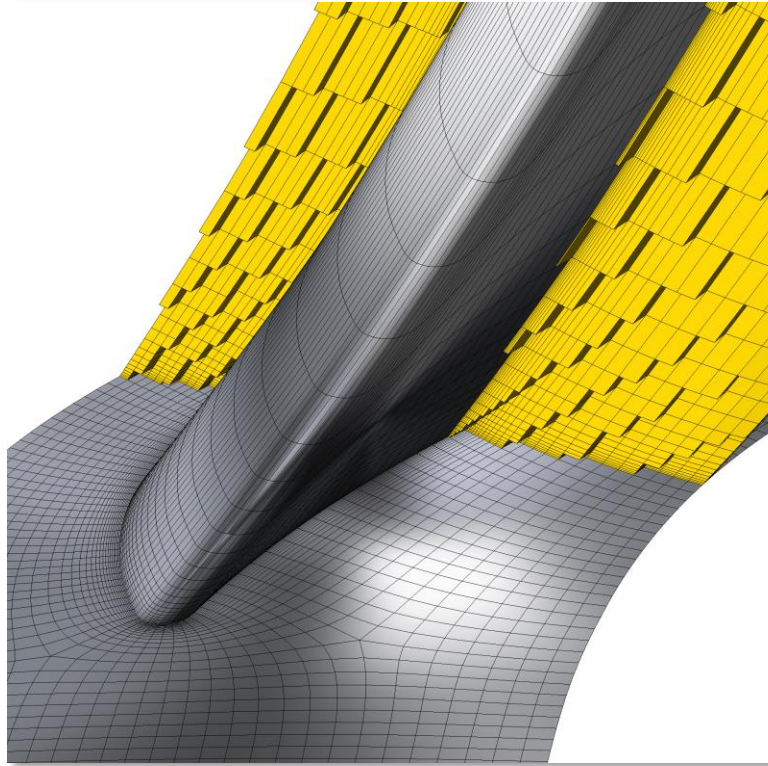
Extending Blade CAD features in TurboGrid

2023 R1 extends the blade CAD features you can create directly in TurboGrid, using only profile/curve files for the geometry input

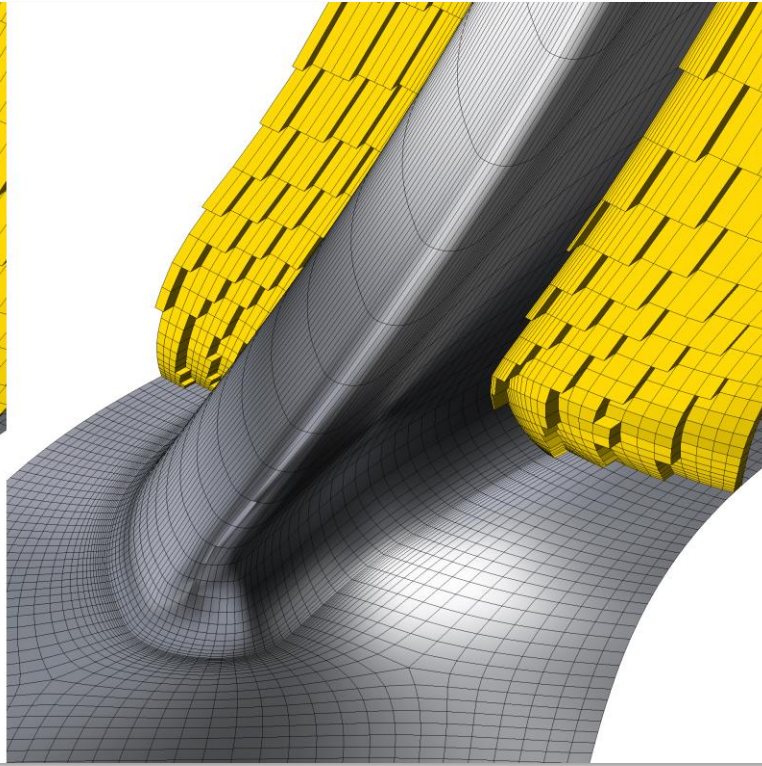
- Add blade blends (for round LE/TE)
 - Now supports creating true blend geometry when used with hybrid meshing (low-fidelity and high-fidelity geometry created), avoiding the need for an upstream CAD model with blends
 - Also supports approximate blends with low-fidelity geometry for all-hex meshing
 - Approximate or true blends can be defined in a NDF file. Reading the NDF file into TurboGrid will create the blend geometry
- Create partial tip geometry at the hub and shroud
- Adjust the blade stagger angle



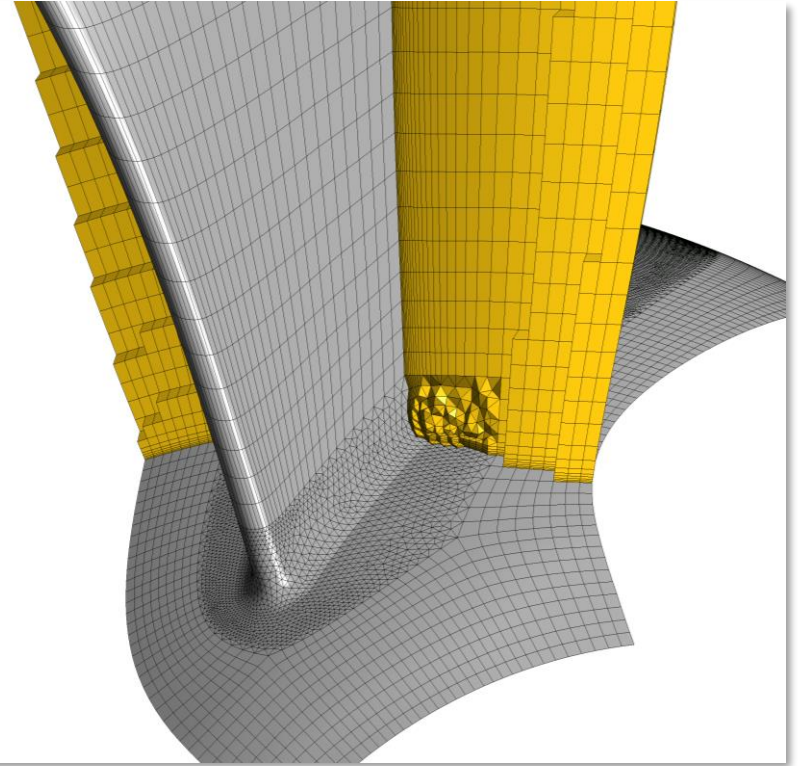
Adding Blade Blends in TurboGrid



*Import profiles/curves and
create all-hex mesh*



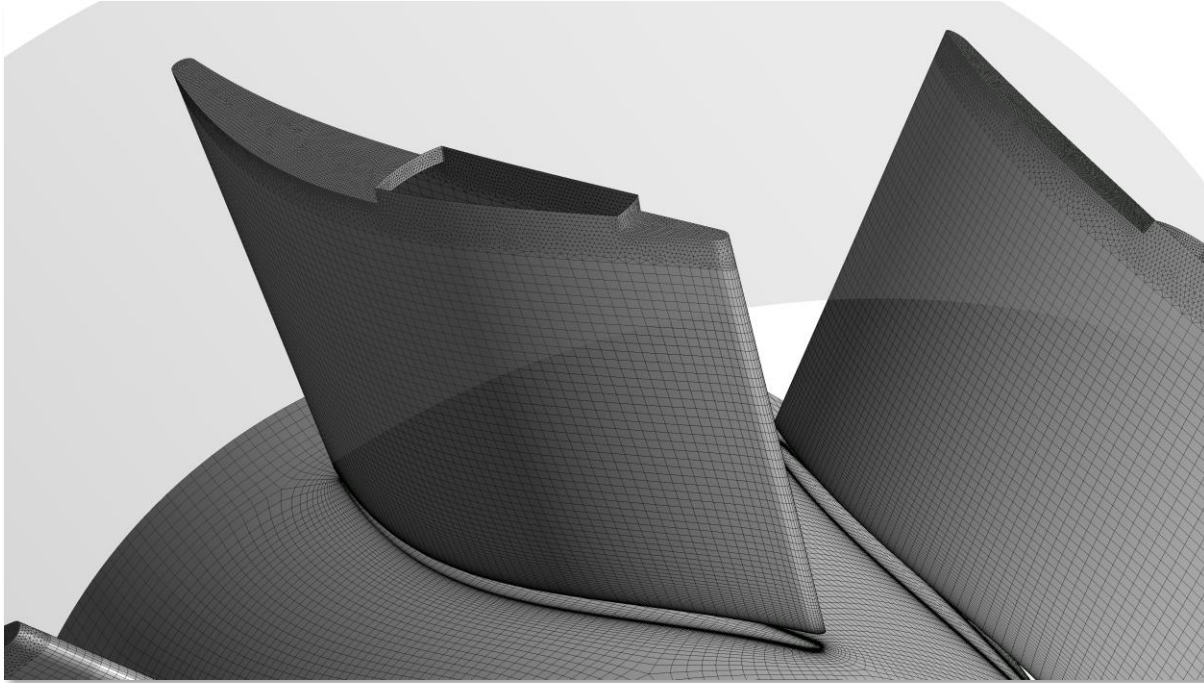
*Add approximate blends,
retaining all-hex mesh*



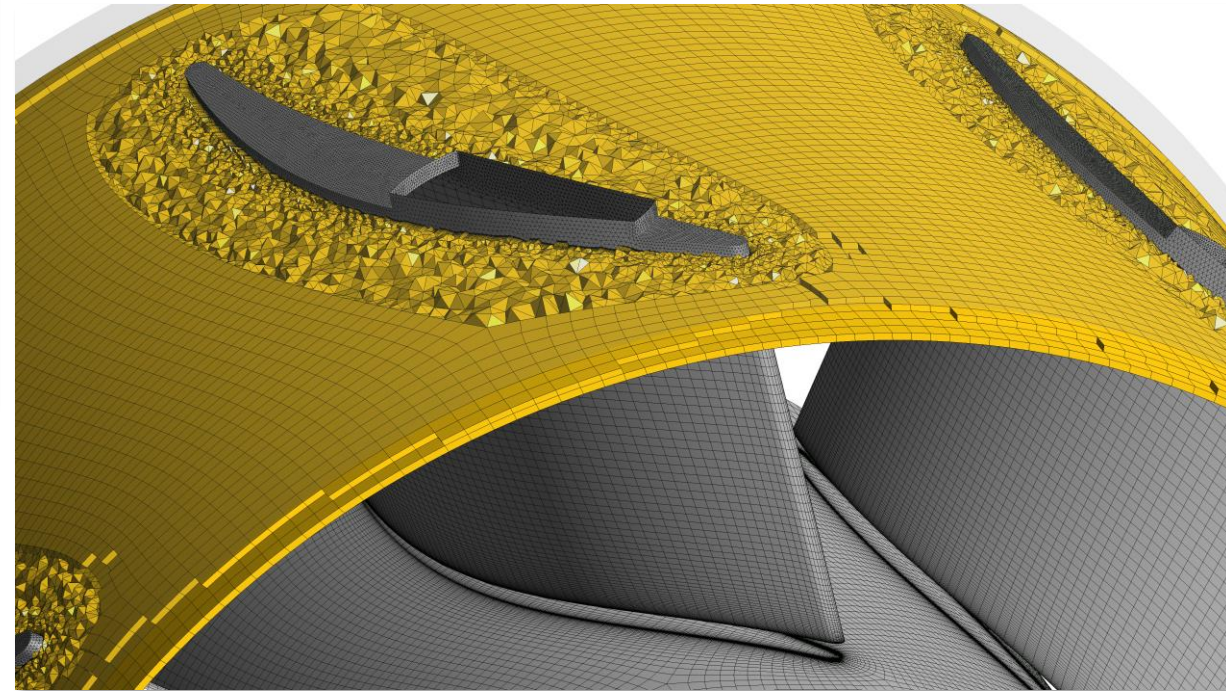
*Or TurboGrid can create the high-fidelity
CAD representation and add true blends
then use fully-automated hybrid meshing*

NDF file support for all options

/ Create Partial Tip Gap Geometry in TurboGrid

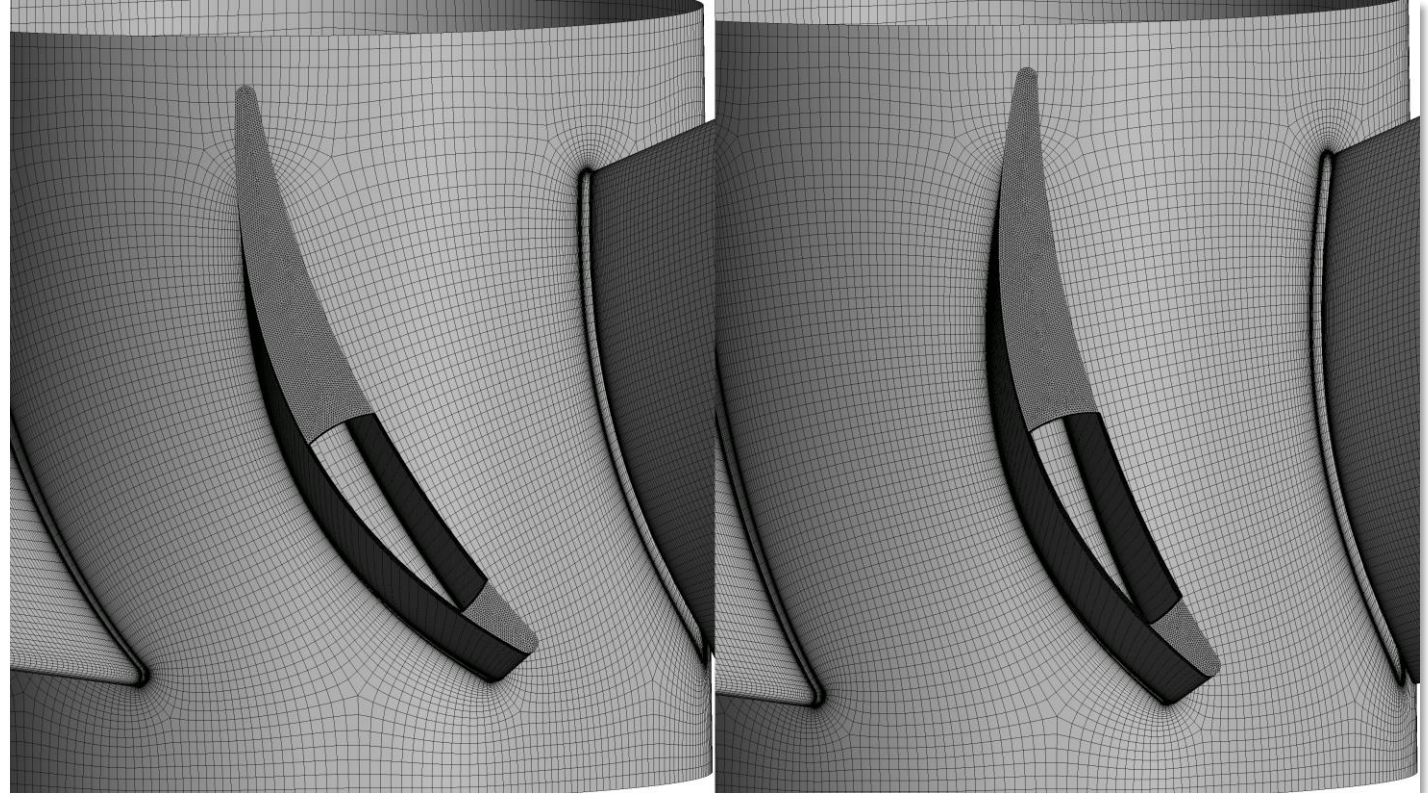
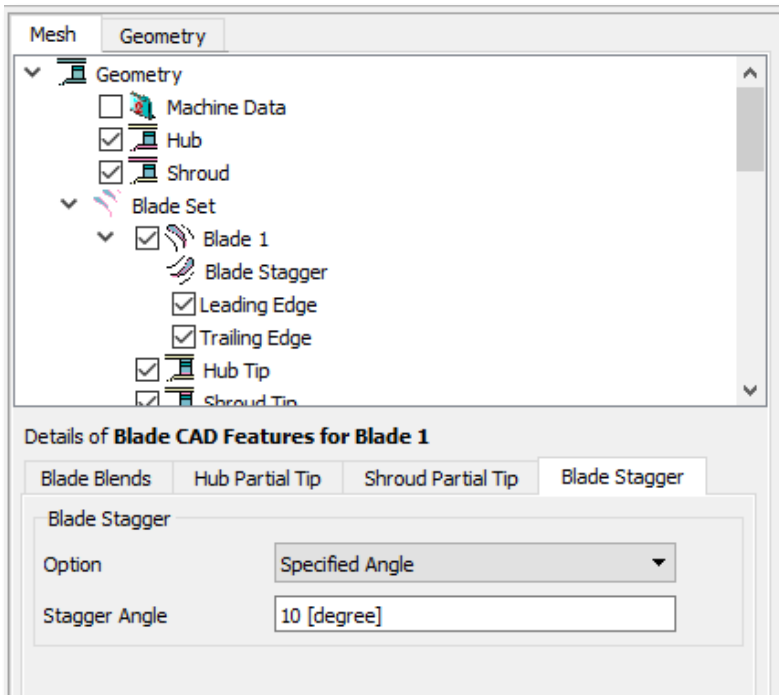


Add the partial tip geometry in TurboGrid at the hub and/or shroud, then automatically mesh with hybrid meshing



Adjust Stagger Angles in TurboGrid

Easily adjust the blade stagger angle in TurboGrid without modifying the upstream geometry, then simply update the mesh



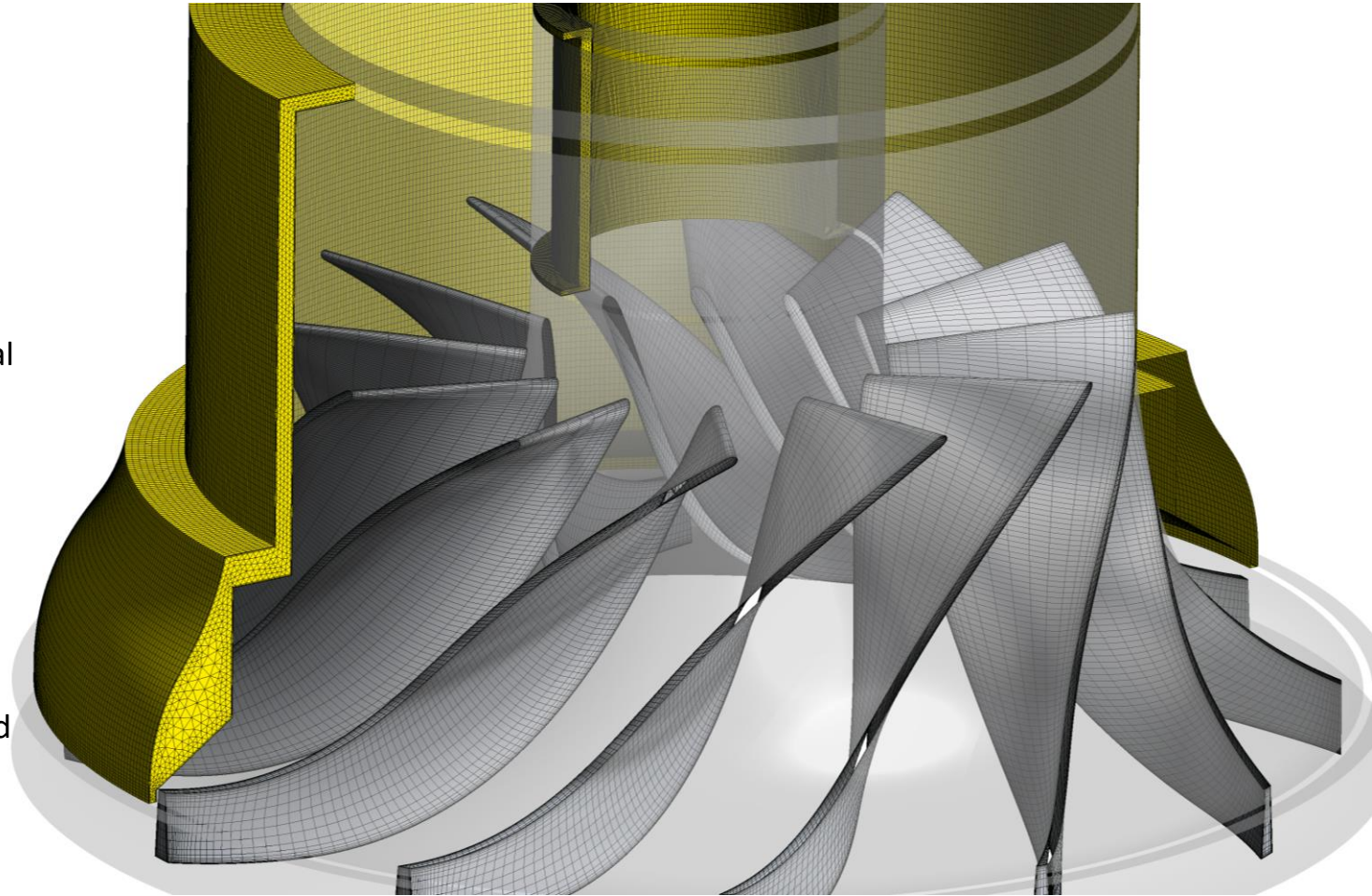
Baseline, 0° stagger angle

Adjusted, 10° stagger angle

/ NDF: import to TurboGrid & secondary flow path support

NDF (Neutral Data Format) files are an XML definition for blades. The files include the standard blade profiles/curves, plus support for additional features such as blends, and now secondary flow paths

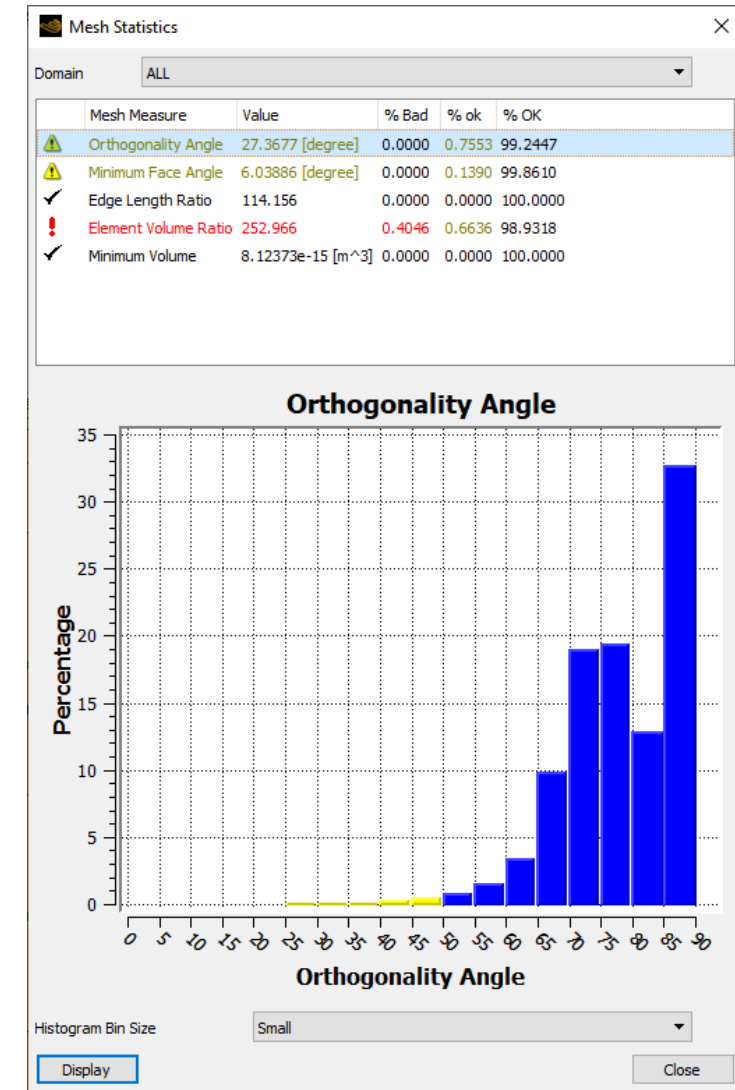
- TurboGrid now supports NDF file import
 - Enables workflows from BladeGen and other blade design tools directly to TurboGrid, without using BladeEditor/Workbench to interactively create additional 3D CAD features
 - All NDF capabilities supported by BladeEditor are supported for NDF import to TurboGrid
 - TurboGrid will automatically create the necessary low-fidelity and/or high-fidelity geometry, depending on the features defined in the NDF file
- Secondary flow path support in NDF files
 - Curves defining secondary flow paths are now supported in NDF files
 - NDF files imported to BladeEditor/TurboGrid will automatically create the secondary flow path geometry/mesh



TurboGrid Mesh Quality Metrics for Hybrid Meshes

Orthogonality Angle introduced as a new mesh metric

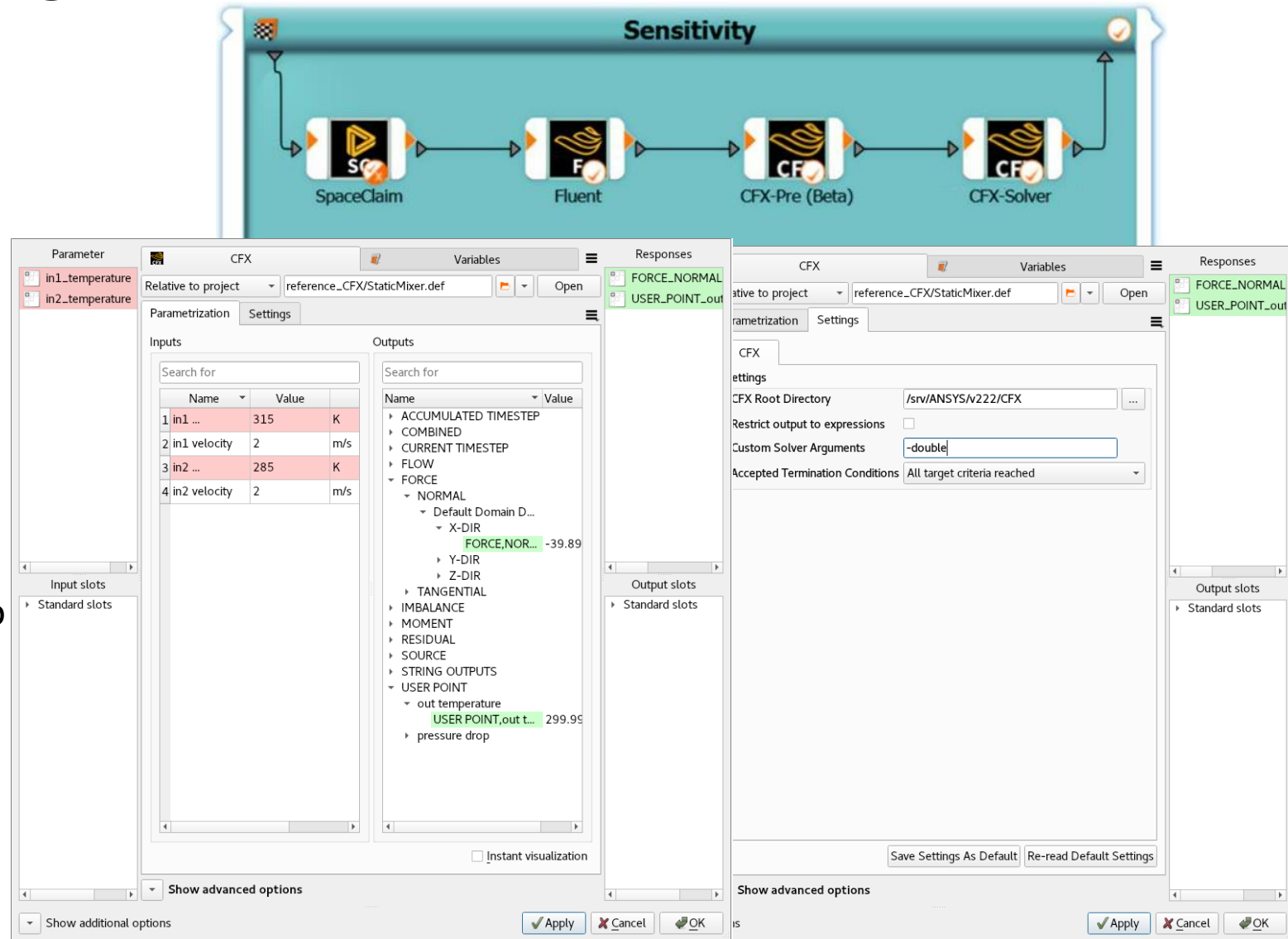
- Orthogonality Angle is the preferred measure for hybrid meshes, instead of Minimum Face Angle
- Orthogonality Angle is calculated in the same way as the CFX Solver, to ensure consistency
- Mesh statistics that are not of interest can now be hidden



CFX plug-ins for optiSlang

Streamlines the workflow for using the CFX Solver in optiSlang

- Configure manually or with a wizard
- Use CEL expressions as input parameters and solver monitor data as output quantities
- Run design points concurrently and leverage optiSlang's parametric licensing
- A separate CFX Partitioner node (beta) allows a single partition step to be re-used for all design points
- Add a CFX-Pre node (beta) to include physics setup in the workflow, driven by a CFX-Pre session file
- Include connections to Fluent Meshing



Aeromechanics: Mapping Mode Shapes

Map complex mode shapes from Mechanical to CFX using System Coupling

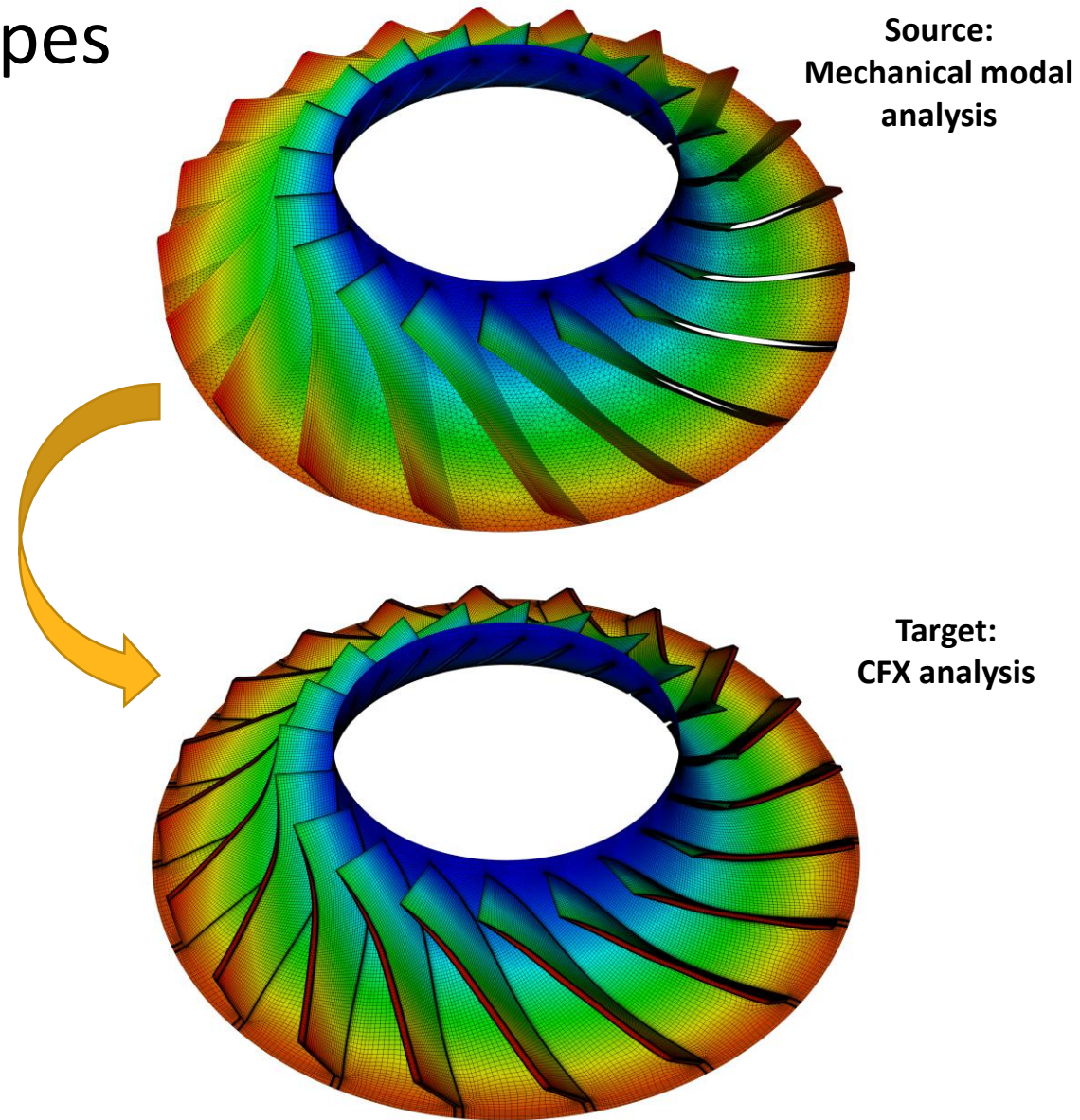
- Supports cyclic symmetry in Mechanical mapped to a periodic sector in CFX
- Builds on mapping of real mode shapes from prior releases

Multi-region support

- For cases where the blade surface, tip, hub, etc. are in separate regions

Full access to System Coupling features for easier mapping

- Instancing
- Geometry transformations
- Non-overlap extrapolation algorithm
- Previewing mapping results in EnSight
- Automatic interface alignment (beta)
- ...



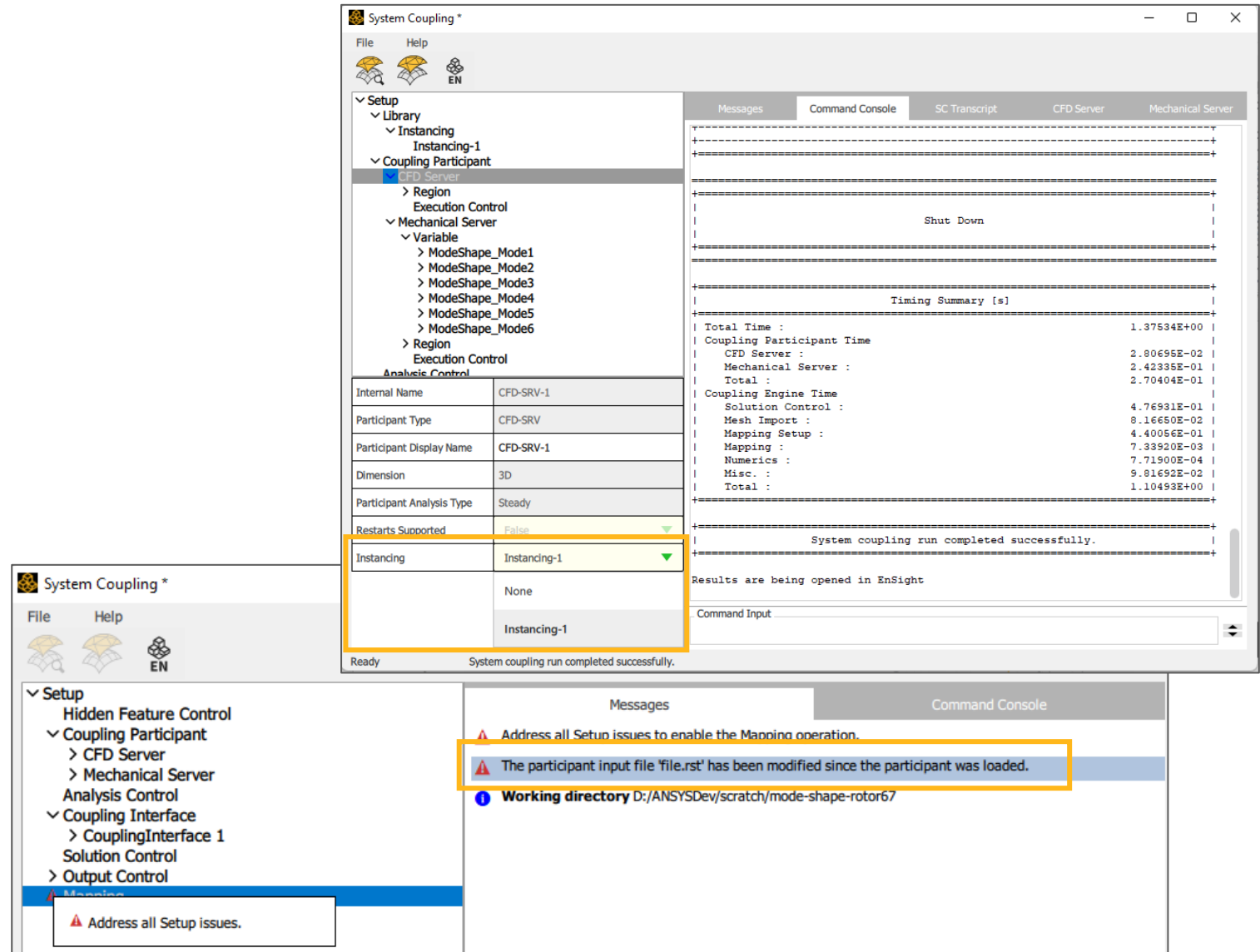
Aeromechanics: Mapping Mode Shapes

Specify CFD instancing from System Coupling GUI

- Can write single or multiple sectors/instances for the CFD target

Automatically detects input file changes if the underlying modal analysis was updated

- Avoids selecting the input file again and repeating the mapping settings



/ Harmonic Analysis

PT = Profile Transformation model
FT = Fourier Transformation model
TRS= Transient Rotor/Stator

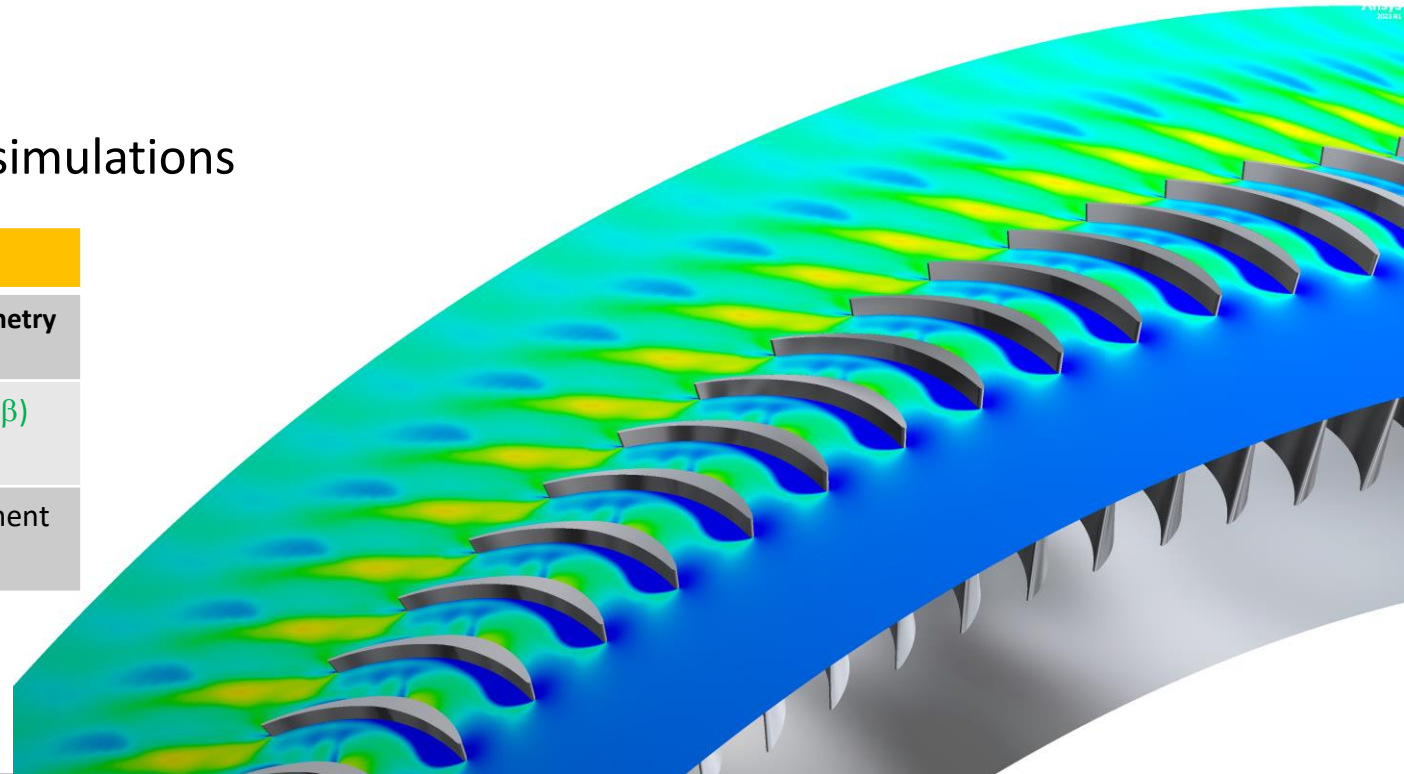
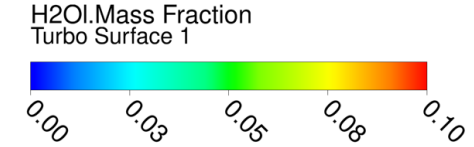
Improved turbulence numerics for better convergence

- Harmonic Analysis convergence has been improved with turbulence numerics improvements
- Enabled by default

Aeromechanics for steam turbines (beta)

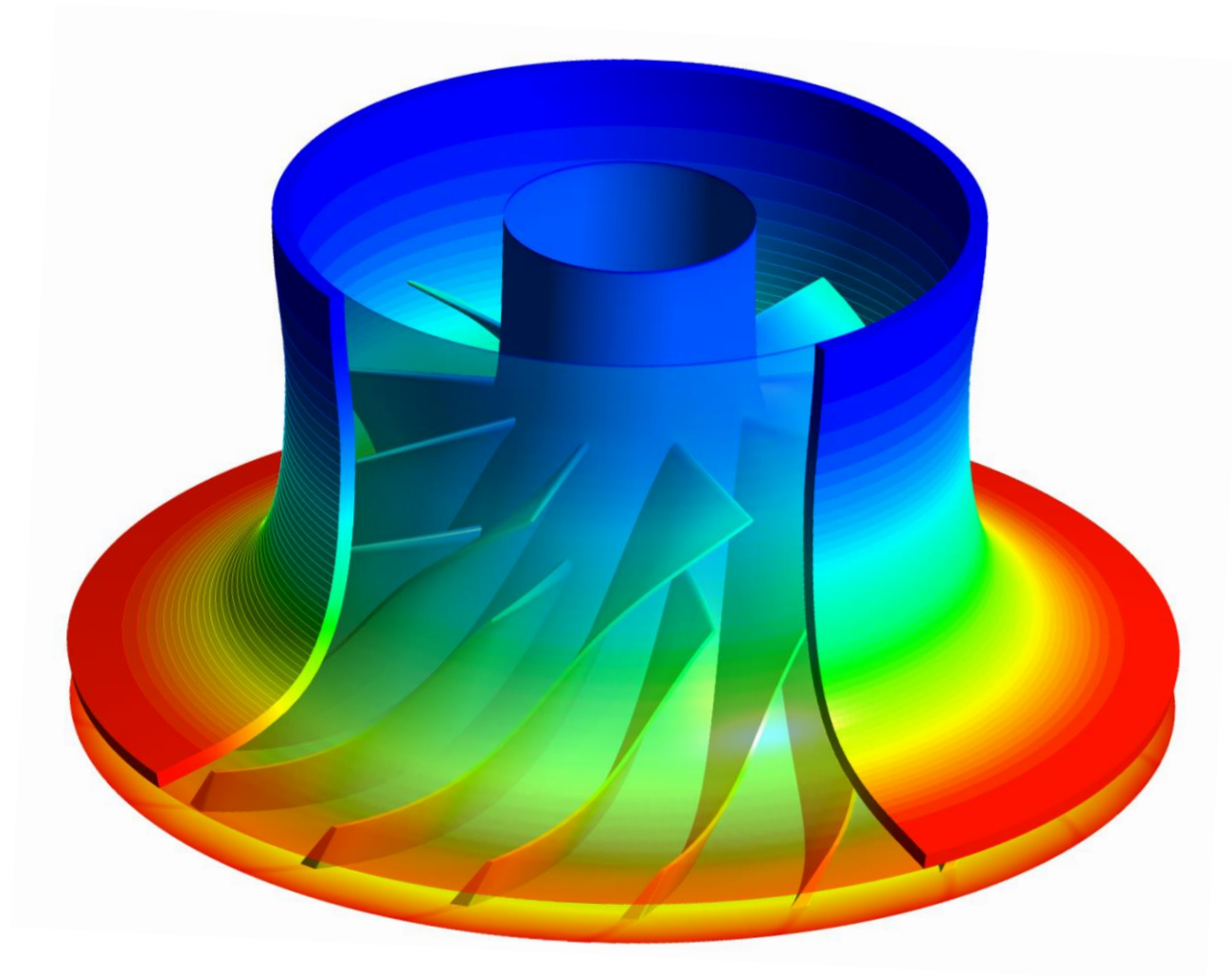
- Harmonic Analysis now supports wet-steam simulations

	Transient Blade Row		Blade Flutter	
	PT-TRS	FT-TRS	Periodic-Sector	Reduce Geometry with FT
Equilibrium Steam	Available (β)	Available (β)	Available (β)	Available (β)
Non-Equilibrium Steam	Available (β)	In development	Available (β)	In development



/ Mixing Plane for CHT (beta)

- New Frame Change option for steady state simulations at fluid-solid interfaces
- Allows better modeling of conjugate heat transfer between rotating fluid domains and stationary solids, e.g. heat transfer into a shroud
- CHT solid sees a circumferentially averaged fluid temperature
 - Avoids unphysical hot-spots

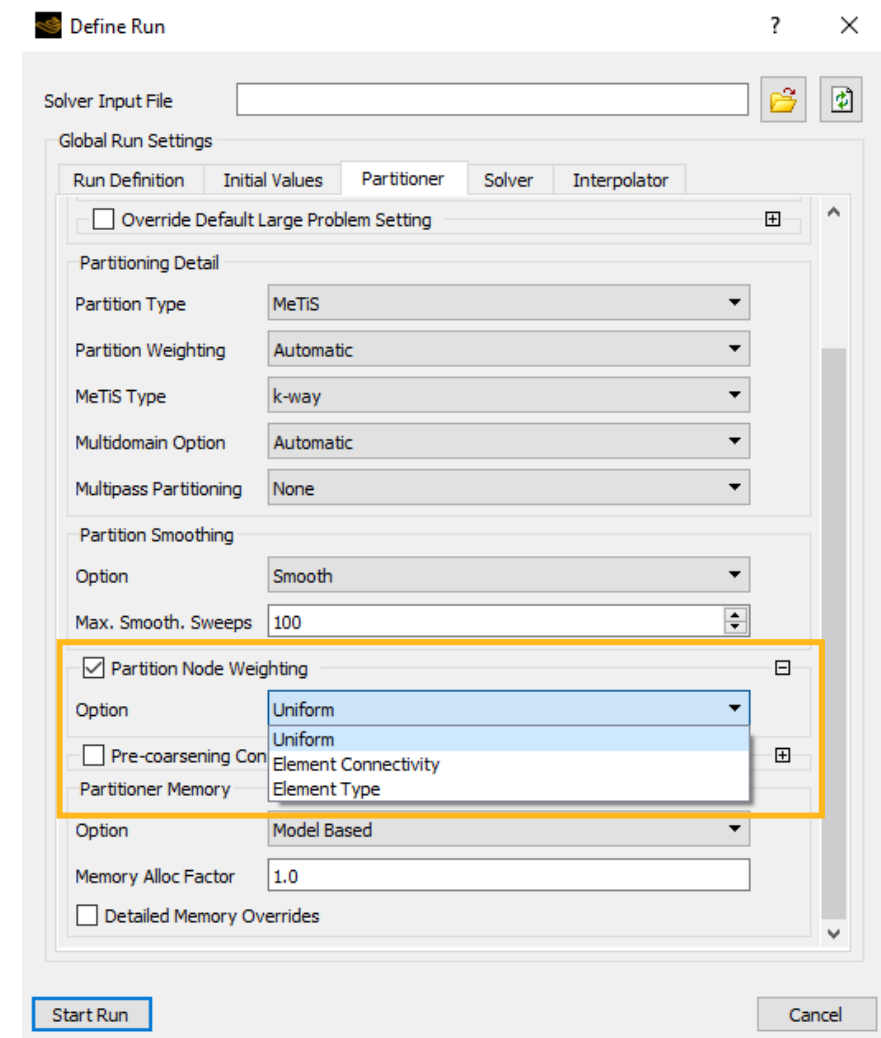


CFX Solver Performance Improvements

New Partition Node Weighting options improve performance on mixed-element meshes

- Creates more balanced partitions
- On average ~10% solver performance improvement across a range of mixed-element mesh cases
- Element Connectivity: weights based on the number of elements connected to a node
- Element Type: weights based on the type of element (hex, tet, etc) connected to a node

The CFX Solver Interpolator read/write operations are now multithreaded, speeding up restarts and jobs where initial results files are provided

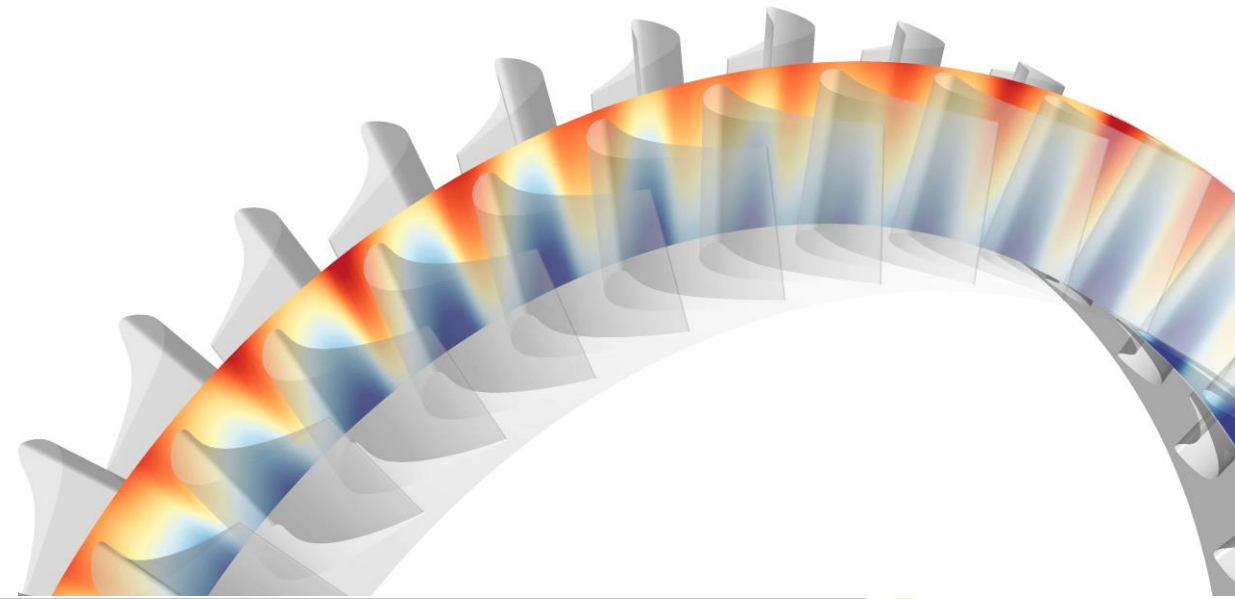
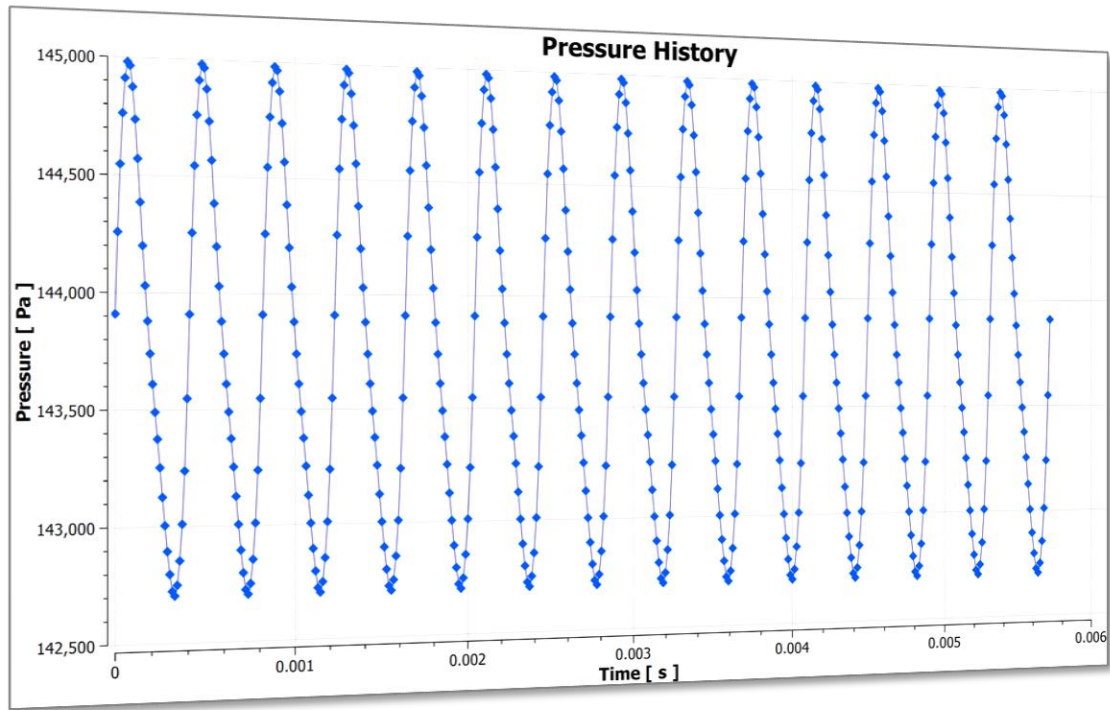
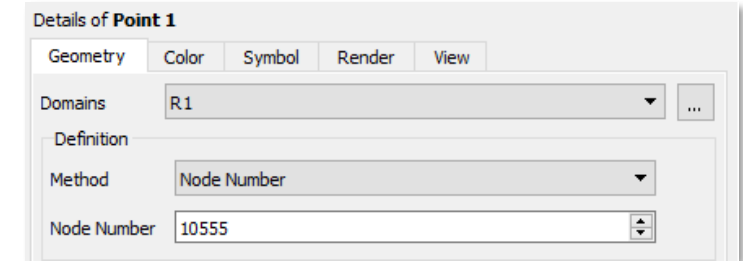


CFD Post Transient Blade Row Charts 100x Faster

TBR "signal" chart generation 100x faster

- CFD Post uses the Fourier coefficient data to create time-dependent charts where possible, reducing chart creation time to a few seconds
- Requires TBR (Fourier compressed) results, a locator that is fixed relative to the local domain and a fixed mesh

When creating points for charts limit the Domains scope to the local domain. For rotating domains use the Node Number Method, so the point remains fixed relative to the domain rotation



 **Ansys**

