

# Release 2022 R1 Highlights

## System Coupling

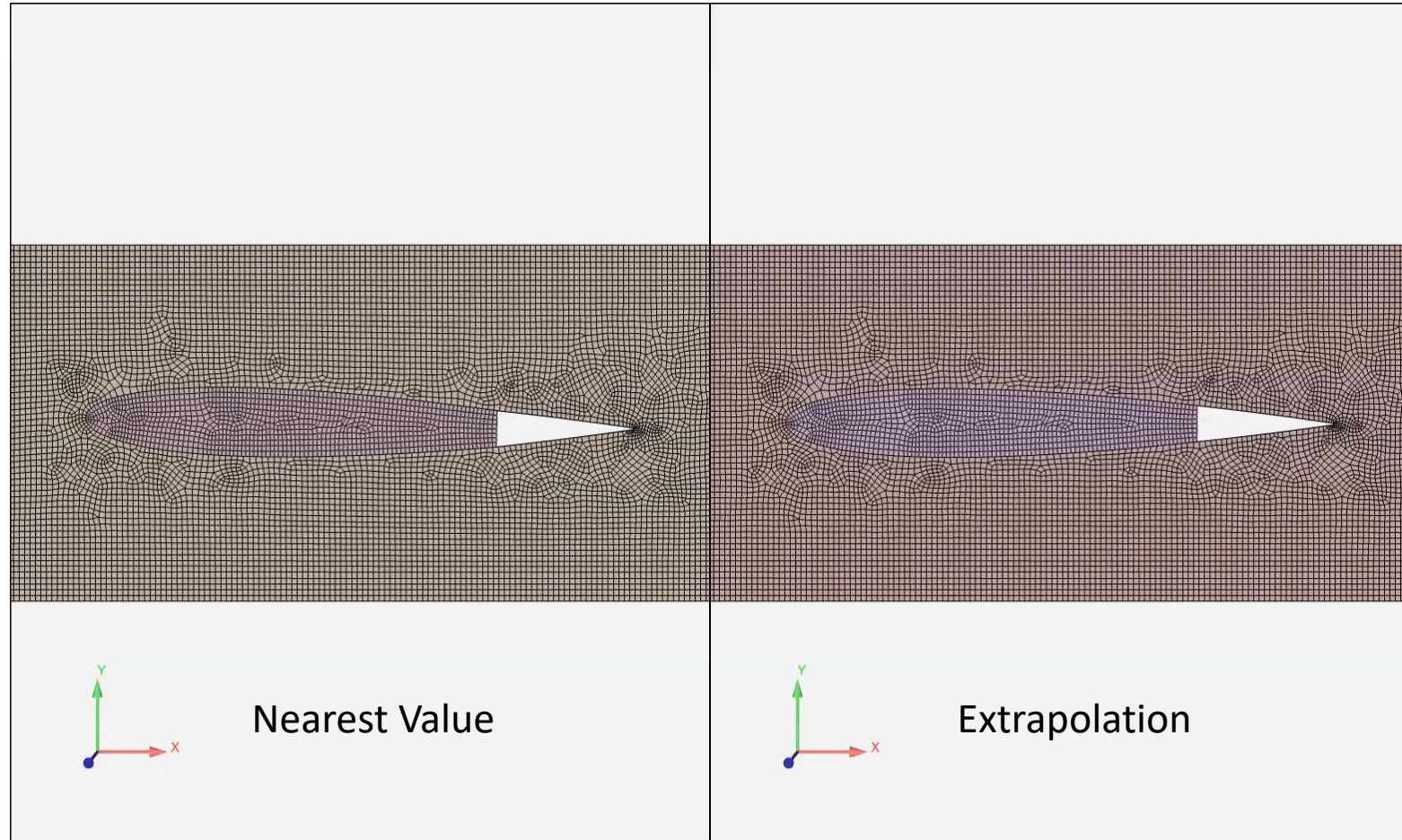


# Contents

- Non-Overlap Mapping for Motion on FSI interfaces
- Performance Improvements
- Miscellaneous Enhancements
- Participant Library
- Geometry Instancing (BETA)

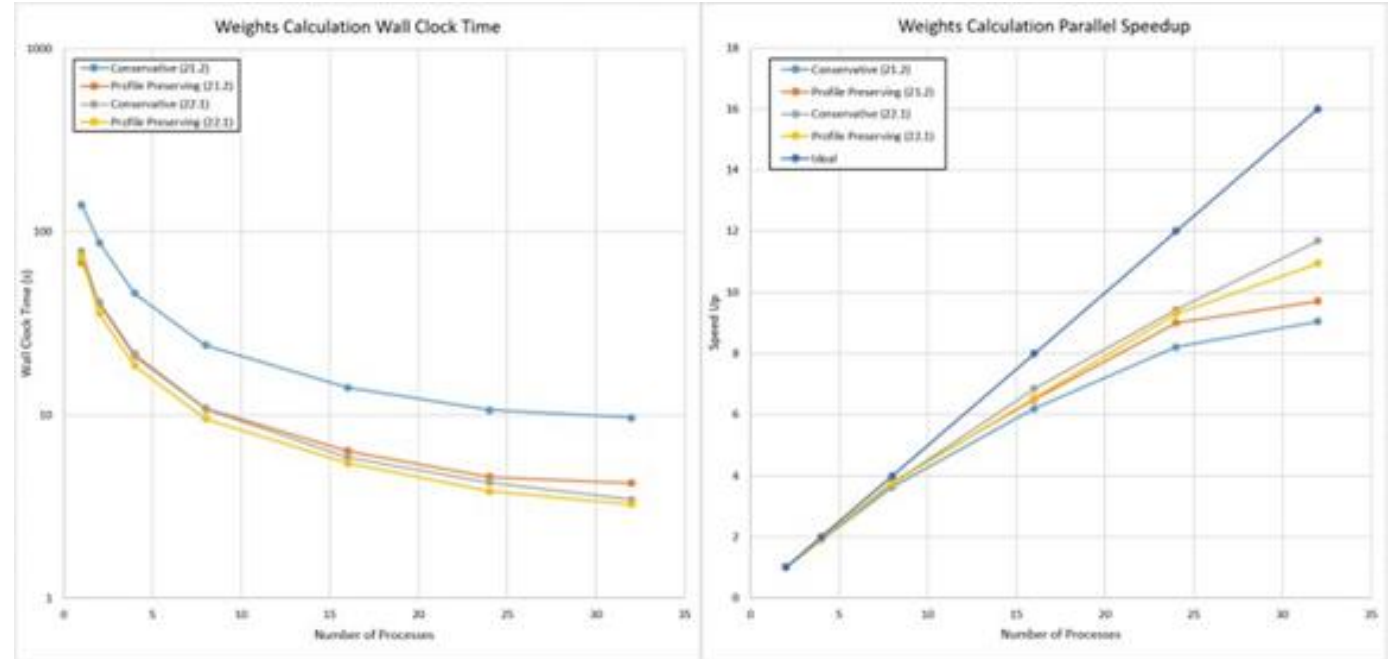
# New Extrapolation Method Improves Mapping Non-Overlap Regions

- New "Extrapolation" method uses a novel procedure to provide a smoother and more realistic data profile on non-overlapping portions of a target surface than the existing "Nearest Value" algorithm
- Available for any profile-preserving data transfers on surfaces



# Mapping Improvements for Faster Co-Simulation with Less Memory

- Parallel improvements for surface-to-surface mapping
- Run-time performance improvements for surface-to-volume mapping
- ~30% memory reduction for surface-to-volume mapping
- ~1.15-2.2x speedup for weights calculations
- ~1.5-20x speedup for interpolation



# Enhancements for Improved User Experience

- Automated replacement of absolute paths with relative paths
- User specified solver input files for restarts
- New Chart view: Simulation Time on x-axis
- Beta: Ascii Output expert settings now available (as Beta)

Option	ProgramControlled
Working Directory	MAPDL\
Additional Arguments	
Parallel Fraction	3
Initial Input	r3D_steadyThermal.dat
Additional Restart Input File	adyThermal_restart.dat

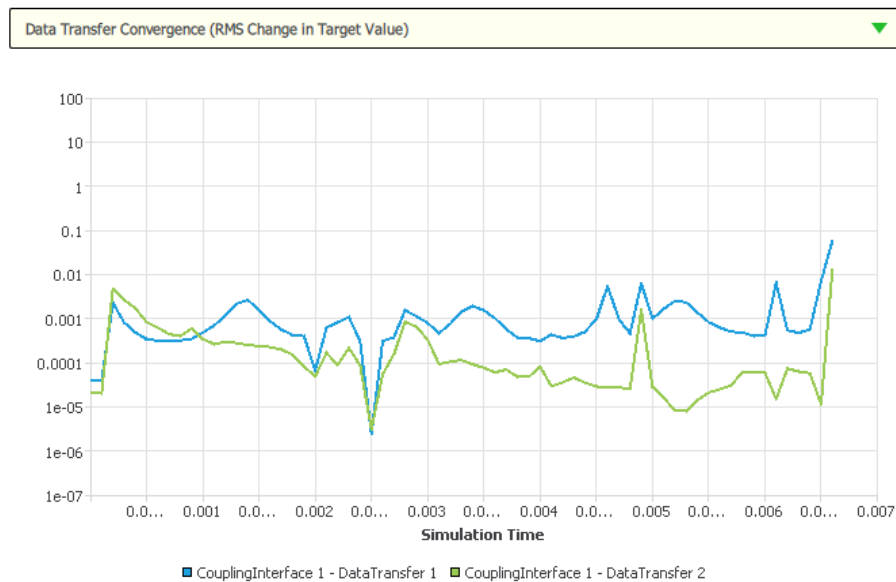
Update Control  
Execution Control  
> Analysis Control  
> Coupling Interface  
Solution Control  
v Output Control  $\beta$   
> Results  $\beta$

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Ascii Output  $\beta$

Solution

Option	Off
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# New APIs Support Volume Mesh, Complex Numbers and More

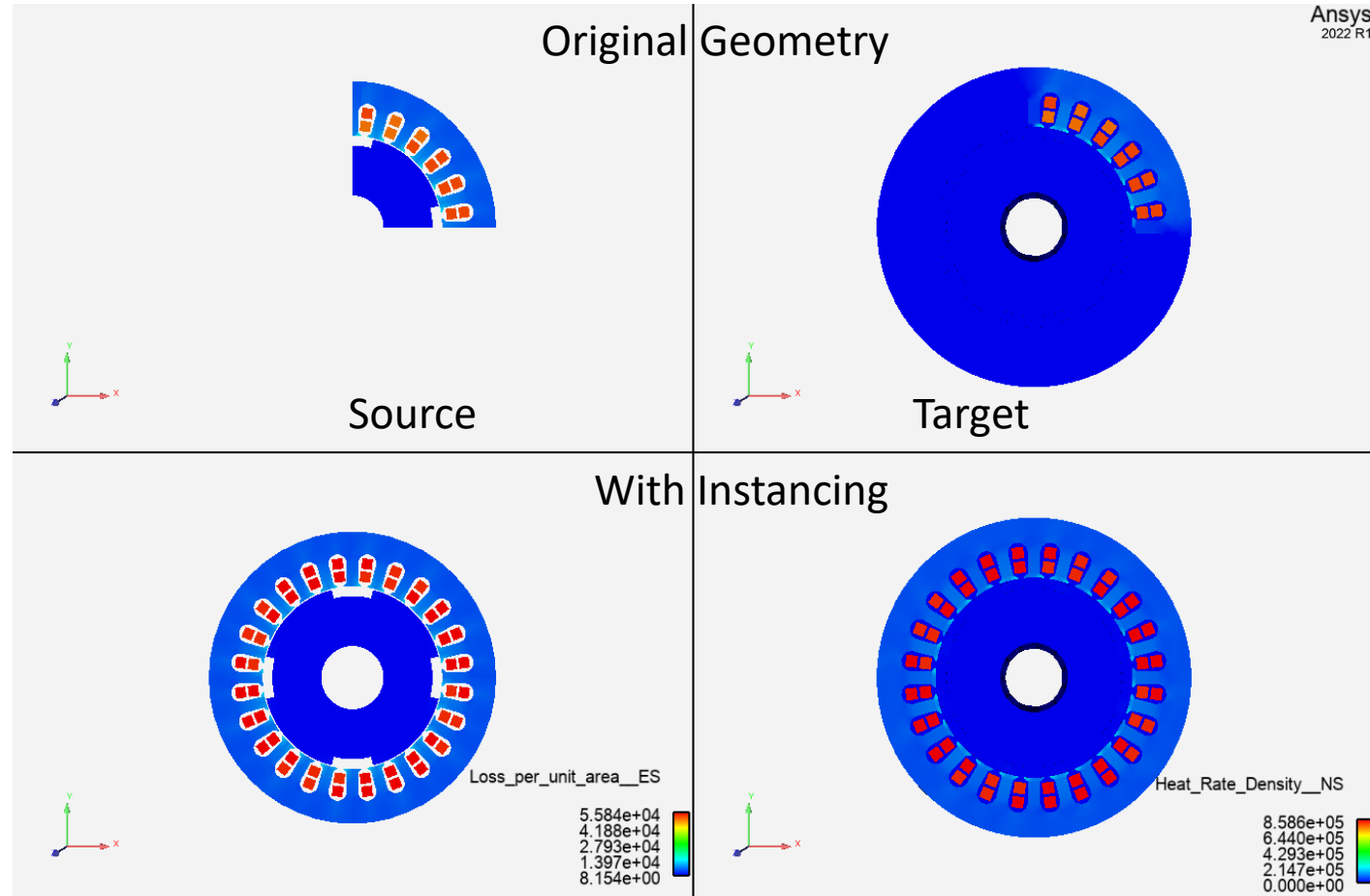
- Available with participants using new 2.0 APIs
- Volume mesh support
  - Face-based (for polyhedral elements)
  - Element-based (for high-order elements)
  - Full support for parallel processing, co-simulation & standalone mapping, shared zones, etc.
- Added support for complex solution data
  - Ex: mapping cyclic mode shapes for aero-damping
- Additional variable attributes
  - Light-weight information about the variable
  - Integer-valued; Real-valued with dimensionality
- Standalone mapping capabilities
  - Allow mapping of variables with different properties:
    - Source & target locations (nodes vs. elements)
    - Source and target, extensive vs. intensive property



Volume mesh used to map temperature

# Beta: Geometry Instancing

- Replicate a partial geometry to represent the full geometry for mapping
- Target applications:
  - Gas turbine (FSI)
  - Electric machines (thermal-emag)
- Applies to all existing mappings:
  - 3D-3D conservative and profile preserving mapping
  - 2D-2D conservative and profile preserving mapping
  - 2D-3D conservative mapping
  - 3D-2D profile preserving mapping



# Summary



# System Coupling 2022 R1 Advances Co-Simulation

- Improved non-overlap mapping
- Faster mapping and co-simulation
- Improved user experience
- New APIs for participants
- Beta: Geometry Instancing

**New APIs Support Volume Mesh, Complex Numbers and More**

- Available with participants using new 2.0 APIs
- Volume Mesh
- Face-based
- Element-based
- Full system
- Standard
- Added
- Ex: mesh
- Additional
- Light
- Integer
- Standard
- Allow
- Solution
- Solution

**Enhancements for Improved User Experience**

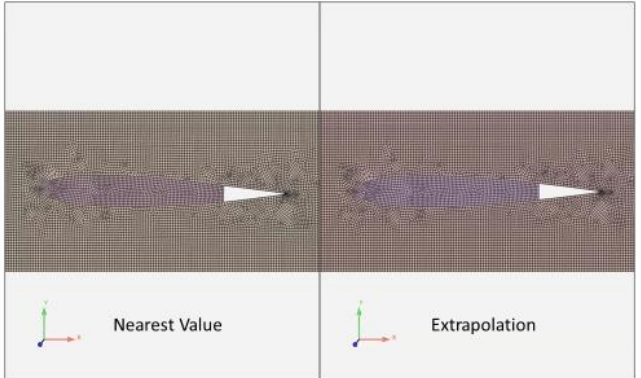
- Automated replacement of
- Us
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- Or
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- No

**Mapping Improvements for Faster Co-Simulation with Less Memory**

- Parallel improvements for surface
- Run
- Imp
- Volu
- ~30%
- ~1.1x
- ~1.5x

**New Extrapolation Method Improves Mapping Non-Overlap Regions**


- New "Extrapolation" method uses a novel procedure to provide a smoother and more realistic data profile on non-overlapping portions of a target surface than the existing "Nearest Value" algorithm
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The image shows two side-by-side comparisons of data mapping on a non-overlapping surface. The left side, labeled 'Nearest Value', shows a jagged and noisy data profile. The right side, labeled 'Extrapolation', shows a much smoother and more realistic data profile. Both images include a 3D coordinate system at the bottom left.

10  
8  
6  
4

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