



Advanced Simulation Summit

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3DExperience Fluid Dynamics Engineer Role

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Agenda

Fluid Dynamics Engineer – First Look

Key Features and Applications

Conclusion

Meet Our Team



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Sr. Applications Specialist
Harpreetm@cadmicro.com

Fluid Dynamics Engineer First Look

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Key Features


- Explicit Model Definition


Commands


✓ A model and sections have been created.


Create a fluid domain if you do not have a part that represents the fluid volume. All parts must have sections assigned.


 **Model Setup**
Specifies the fluid domain and material, mesh parameters, and optionally a bounding box and heat transfer parts.


 **Fluid Domain**
Specifies the fluid regions of the model.


 **Material Palette**
Applies materials to regions of your model or modifies material properties.

 **Fluid Section**
Applies properties to a region that define an area with continuous fluid media.

 **Solid Section**
Applies properties to a region where the material is continuous through the thickness of the part.

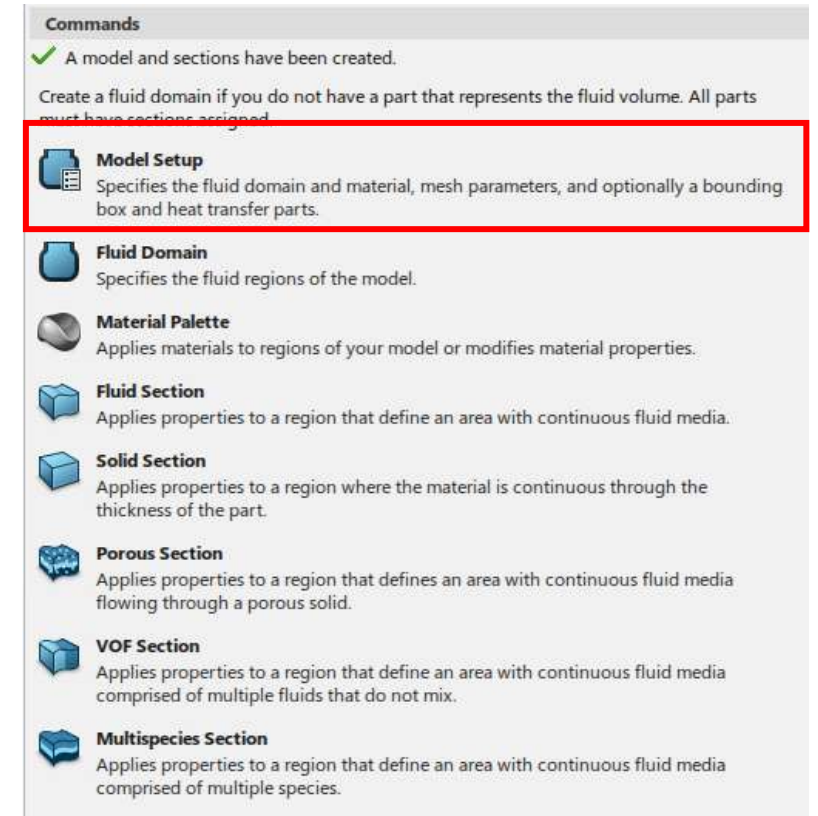
 **Porous Section**
Applies properties to a region that defines an area with continuous fluid media flowing through a porous solid.

 **VOF Section**
Applies properties to a region that define an area with continuous fluid media comprised of multiple fluids that do not mix.

 **Multispecies Section**
Applies properties to a region that define an area with continuous fluid media comprised of multiple species.

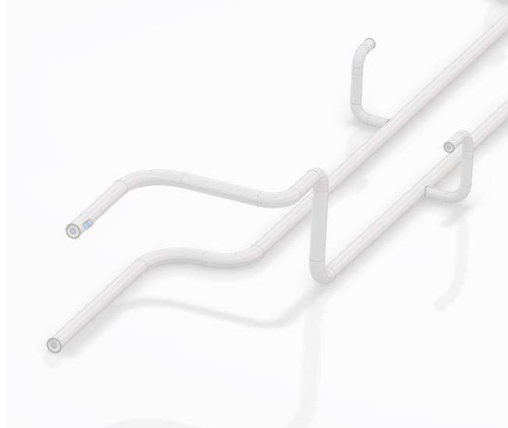
Key Features

- Explicit Model Definition
 - Explicitly define the computational domain



Key Features


- Explicit Model Definition
 - Explicitly define the computational domain
 - Subdivide the computational domain





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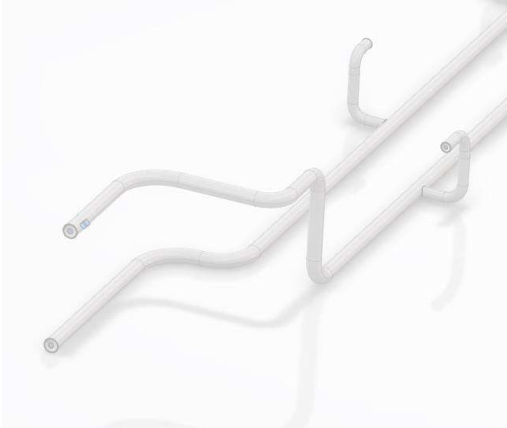
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Key Features


- Explicit Model Definition
 - Explicitly define the computational domain
 - Subdivide the computational domain
 - Multispecies Study, porous media and Volume of fluid for liquid-liquid interaction





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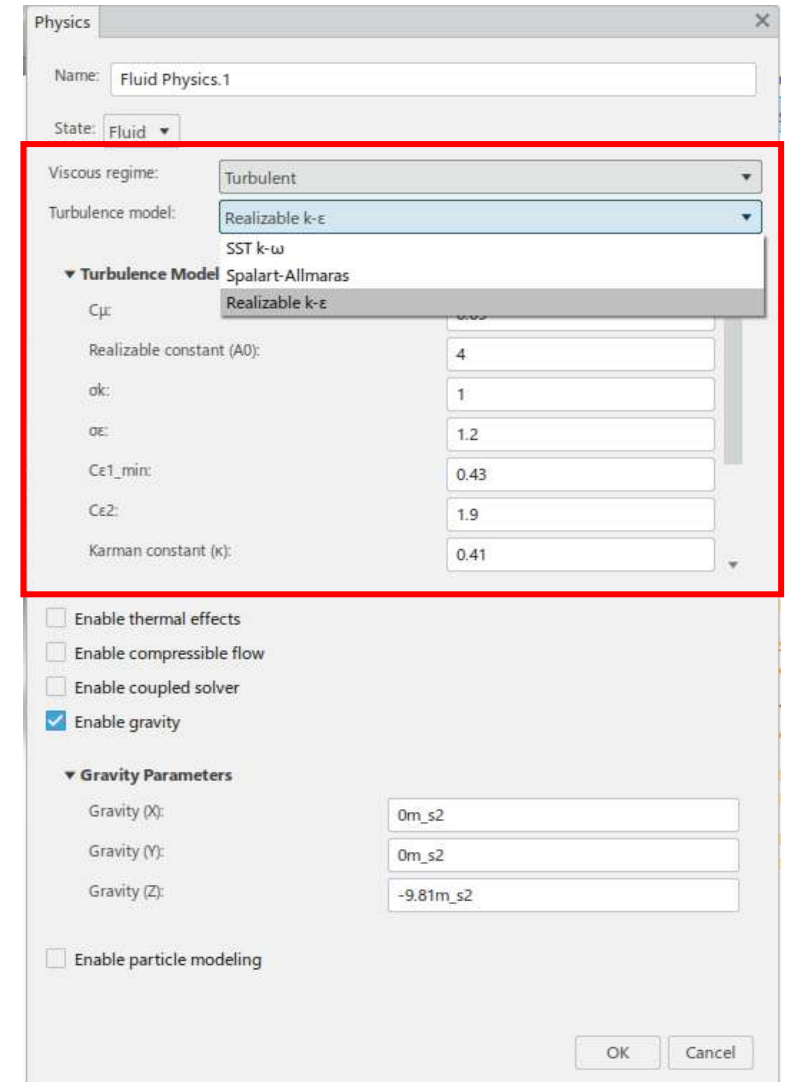
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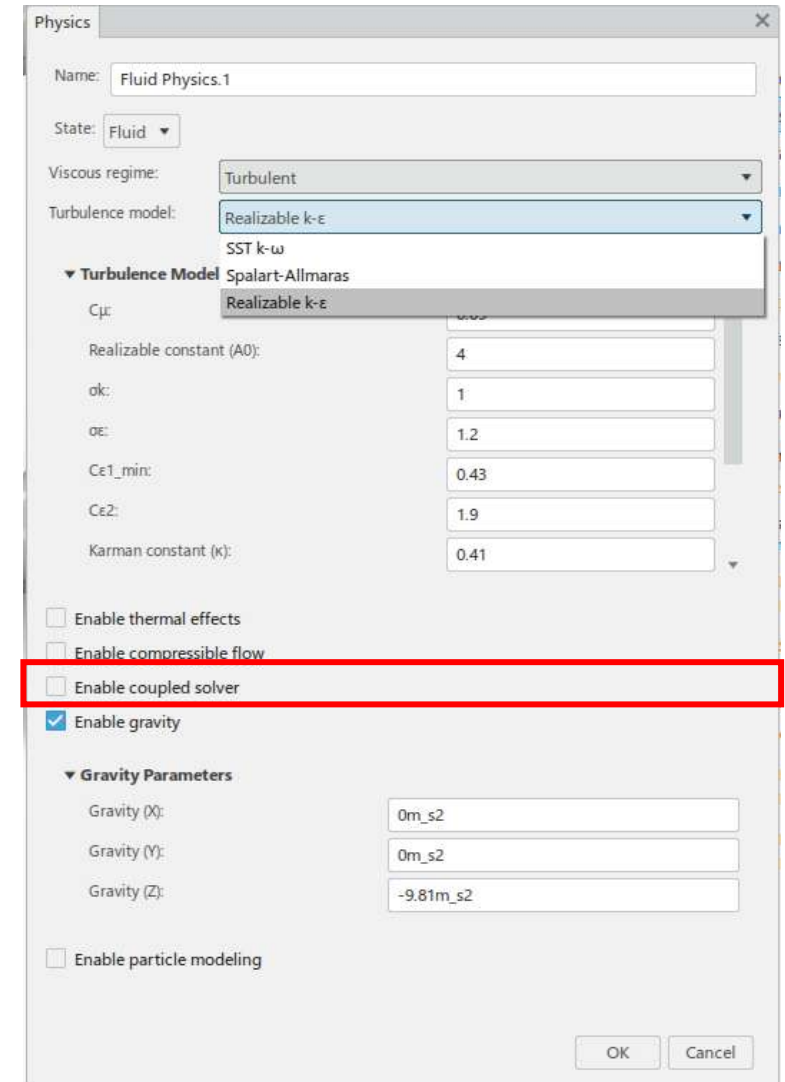
Key Features

- Explicit Model Definition
- Physics:
 - Range of models available
 - SST k-omega – for internal/external/thermal
 - Realizable k-epsilon – for internal flow
 - Spalart-Allmaras – for external aerospace application



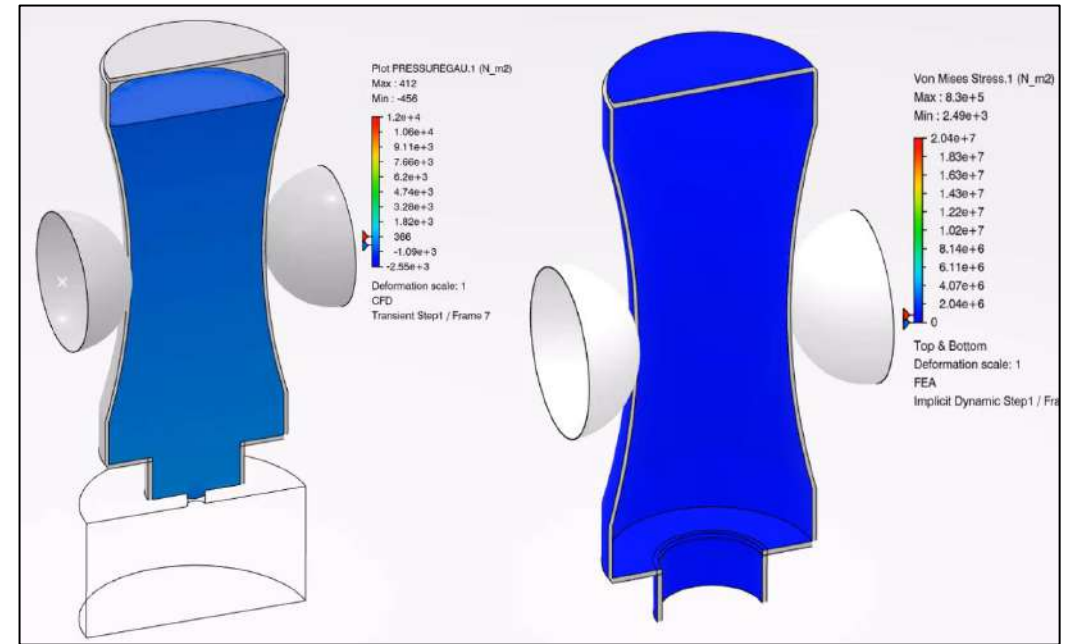
Key Features

- Explicit Model Definition
- Physics:
 - Range of models available
 - Coupled solver for faster convergence



Key Features

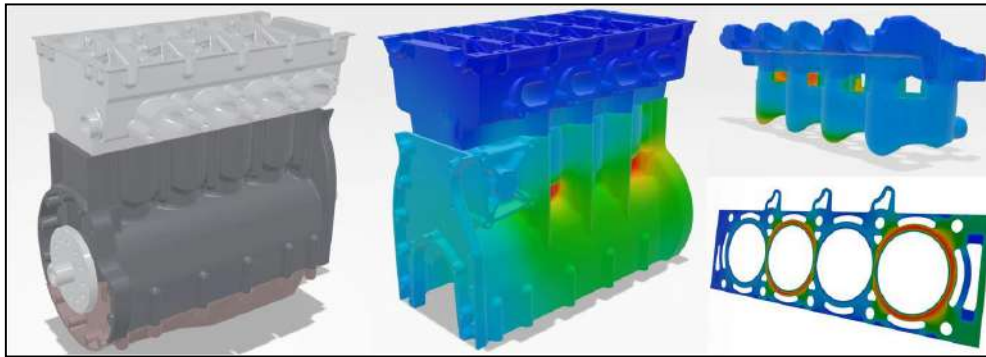
- Explicit Model Definition
- Physics:
 - Range of models available
 - Multiphysics and Fluid Structure Interaction*



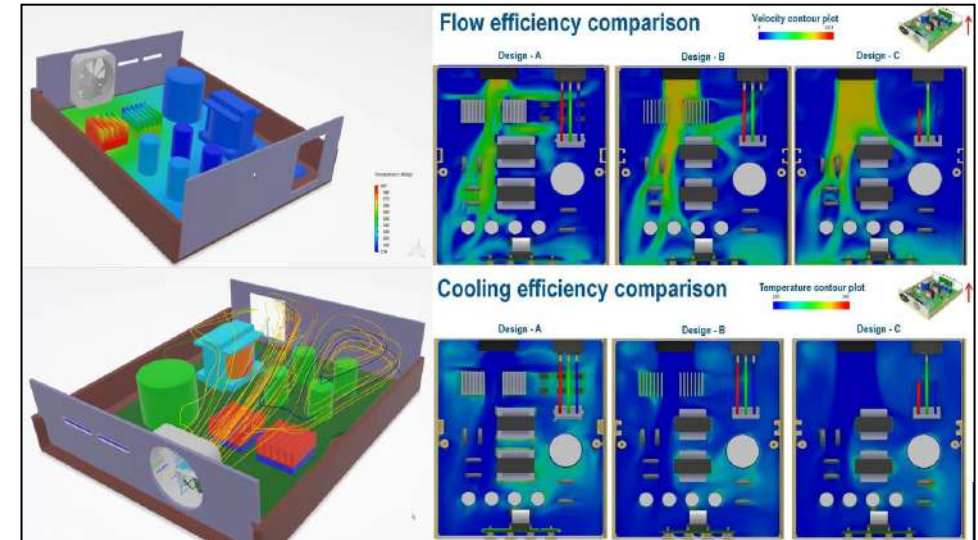
*Requires system modeling role and coupling role on 3DEXPERIENCE

Key Features

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- Physics:
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Equipment Thermal Performance

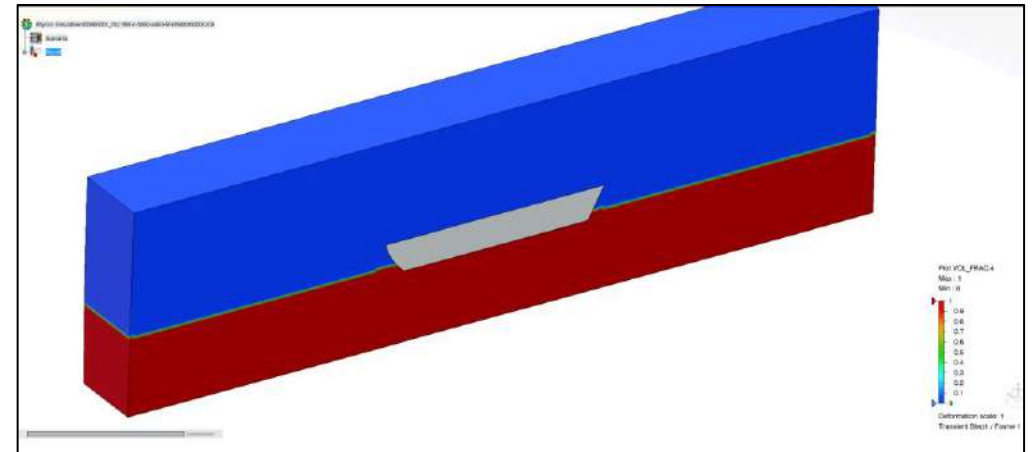


Electronic Device Thermal Performance

*Requires system modeling role and coupling role on 3DEXPERIENCE

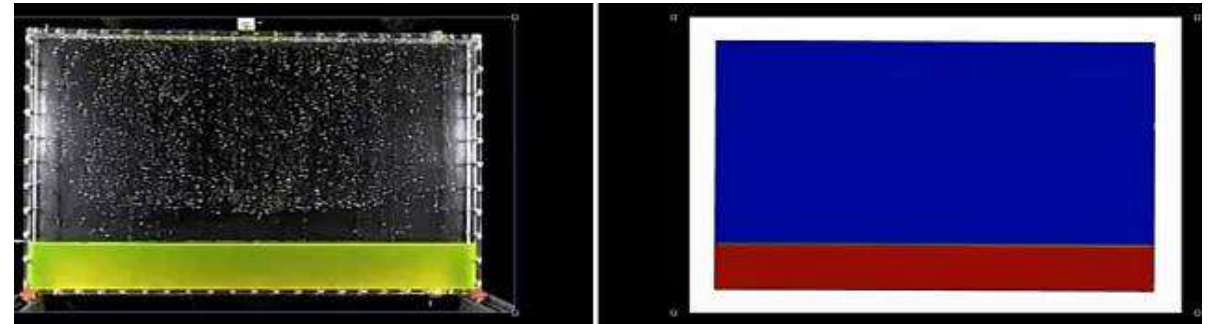
Key Features

- Explicit Model Definition
- Physics:
 - Range of models available
 - Multiphysics and Fluid Structure Interaction
 - Multiphase, Multispecies, and 2-way particle modeling, Rigid Body



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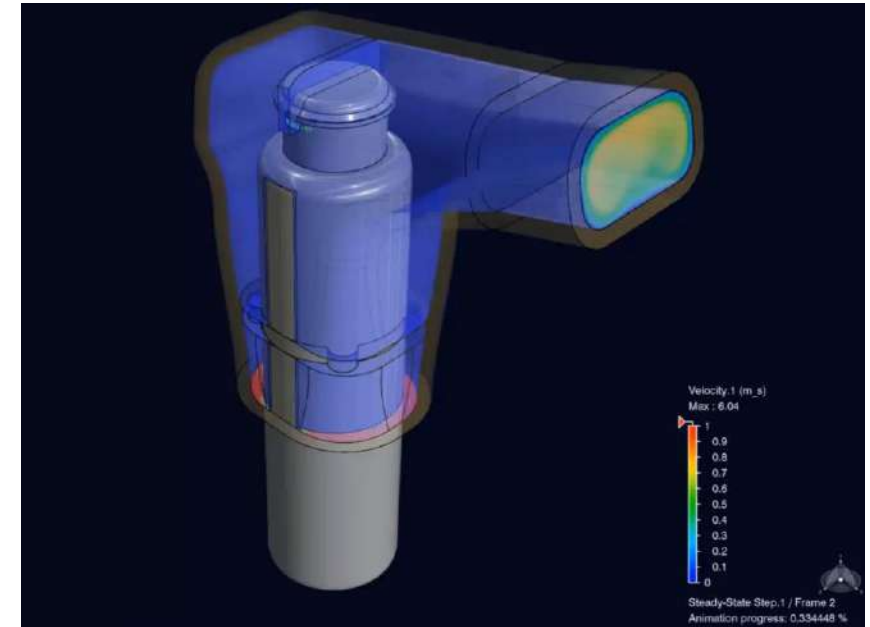
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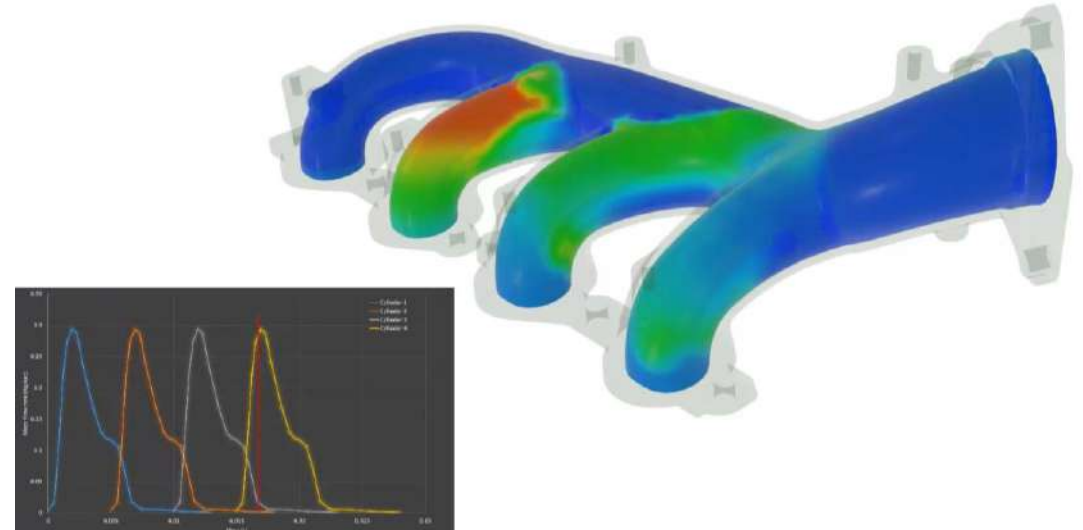
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Key Features

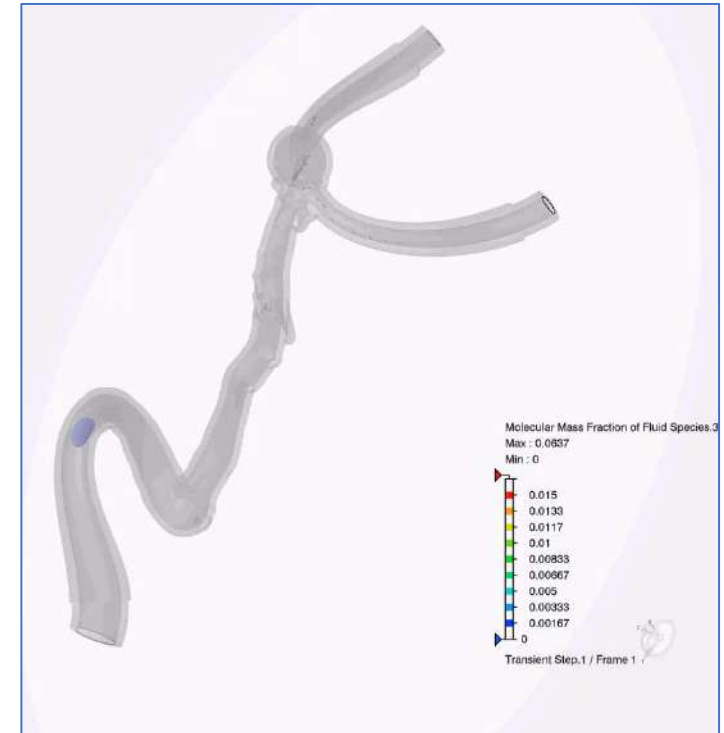
- Explicit Model Definition
- Physics:
 - Range of models available
 - Multiphysics and Fluid Structure Interaction
 - Multiphase and Multispecies
 - Transient Simulation



Key Features

- Explicit Model Definition
- Physics:
 - Range of models available
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 - Multiphase and Multispecies
 - Transient Simulation

Drug injection and diffusion

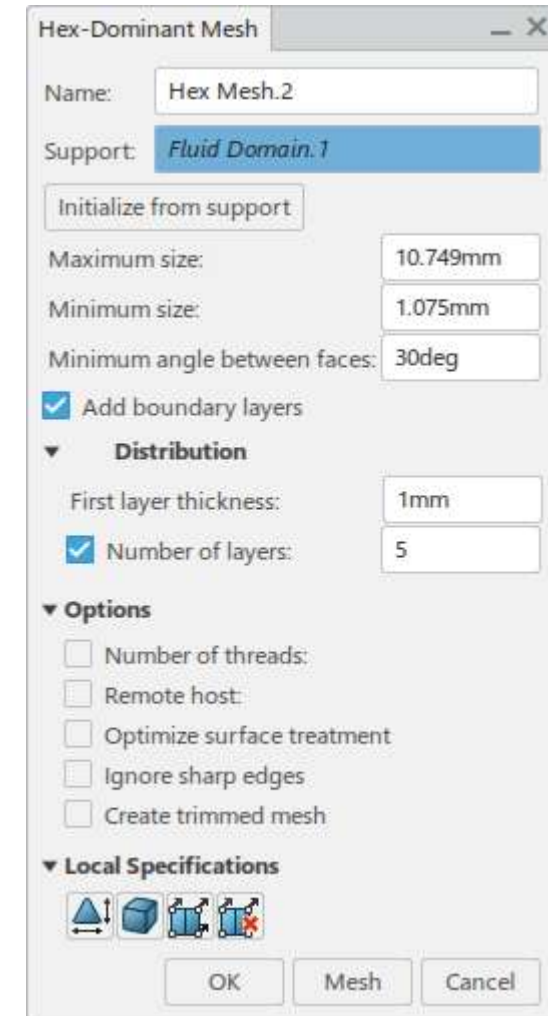


Key Features

- Explicit Model Definition
- Physics:
 - Range of models available
 - Multiphysics and Fluid Structure Interaction
 - Multiphase and Multispecies
 - Transient Simulation
 - Rotating Region

Key Features

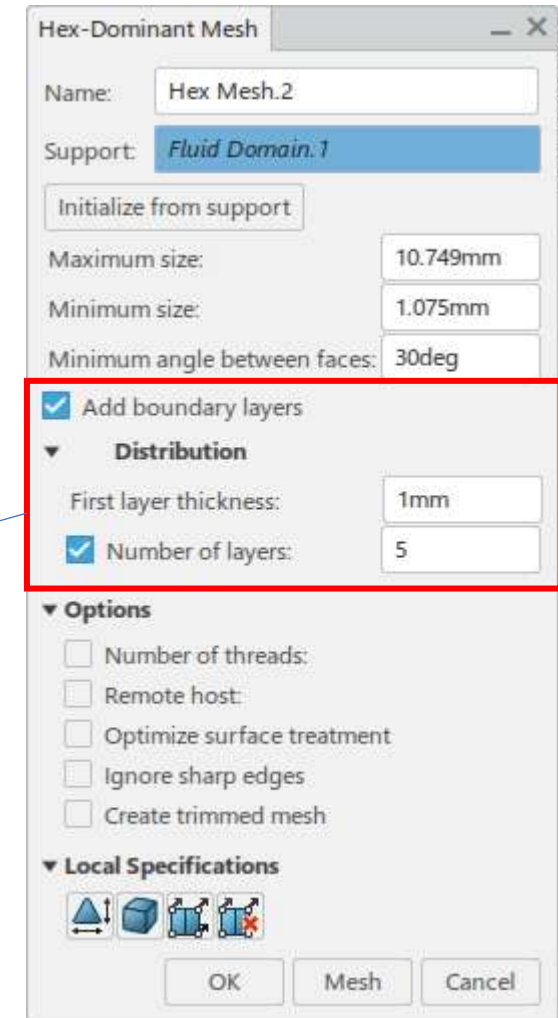
- Explicit Model Definition
- Physics
- Meshing
 - Hex Dominant Body Fitted Mesh



Key Features

- Explicit Model Definition
- Physics
- Meshing
 - Hex Dominant Body Fitted Mesh

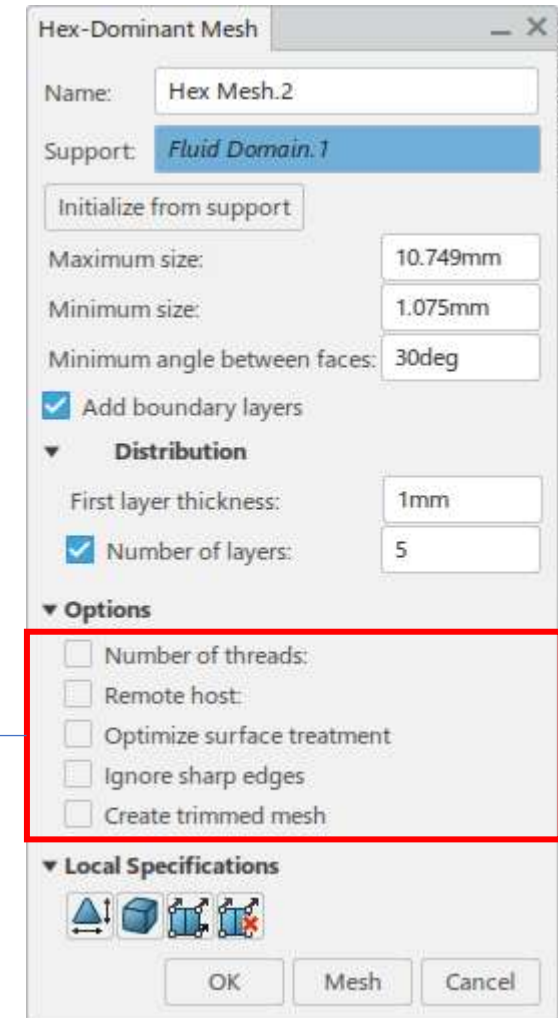
Control the number of boundary layer mesh



Key Features

- Explicit Model Definition
- Physics
- Meshing
 - Hex Dominant Body Fitted Mesh

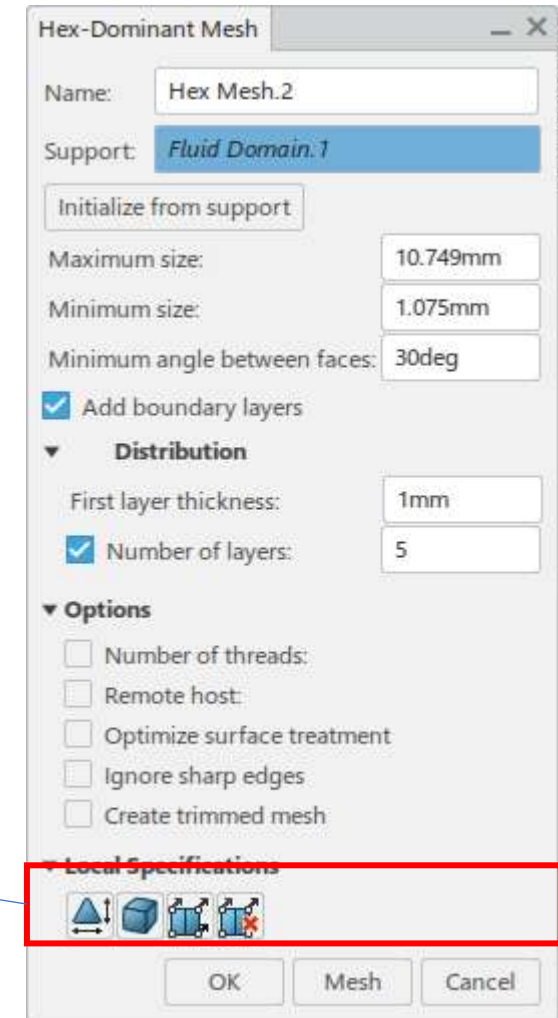
Offload meshing, automate optimization, generate cartesian mesh



Key Features

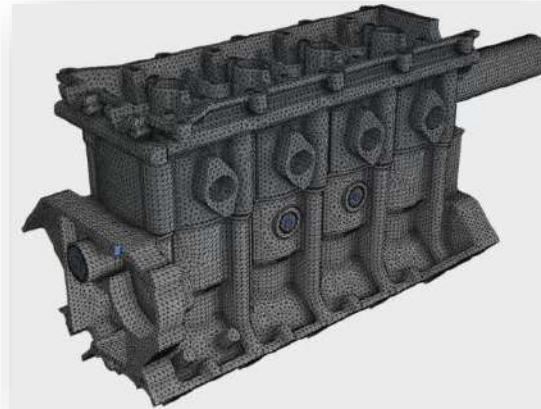
- Explicit Model Definition
- Physics
- Meshing
 - Hex Dominant Body Fitted Mesh

Local mesh controls in the support



Key Features

- Explicit Model Definition
- Physics
- Meshing
 - Hex Dominant Body Fitted Mesh
 - Much more



Hex-Dominant Mesh

Creates a 3D mesh dominated by hexahedron elements.



Tetrahedron Mesh

Creates a 3D mesh of tetrahedron elements.



Sweep 3D Mesh

Creates a 3D mesh by sweeping a surface mesh through a volume.



Surface Triangle Mesh

Creates a surface mesh of triangular elements using saved meshing rules.

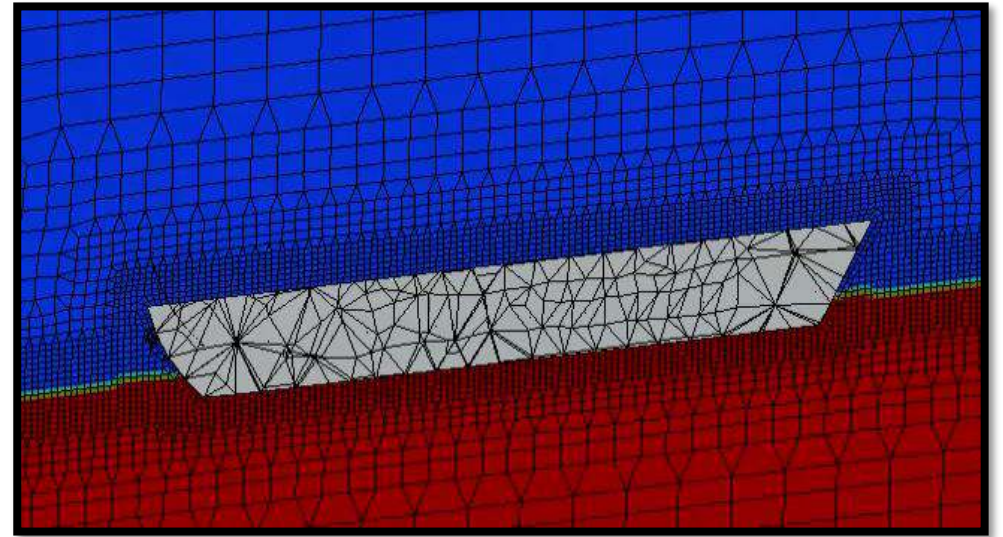


Surface Quad Mesh

Creates a surface mesh of quadrilateral elements using saved meshing rules.

Key Features

- Explicit Model Definition
- Physics
- Meshing
 - Hex Dominant Body Fitted Mesh
 - Much more
 - Morphing mesh for FSI



Key Features

- Explicit Model Definition
- Physics
- Meshing
- Solver
 - Residual Criteria or patented error criteria for faster convergence

The screenshot shows the 'Steady-State Step' dialog box. The 'Name' field is 'Steady-State Step.1' and 'Maximum iterations' is '2000'. The 'Enable auto under-relaxation for all equations' checkbox is unchecked. The 'Stopping Criteria' section is highlighted with a red box and contains the following settings:

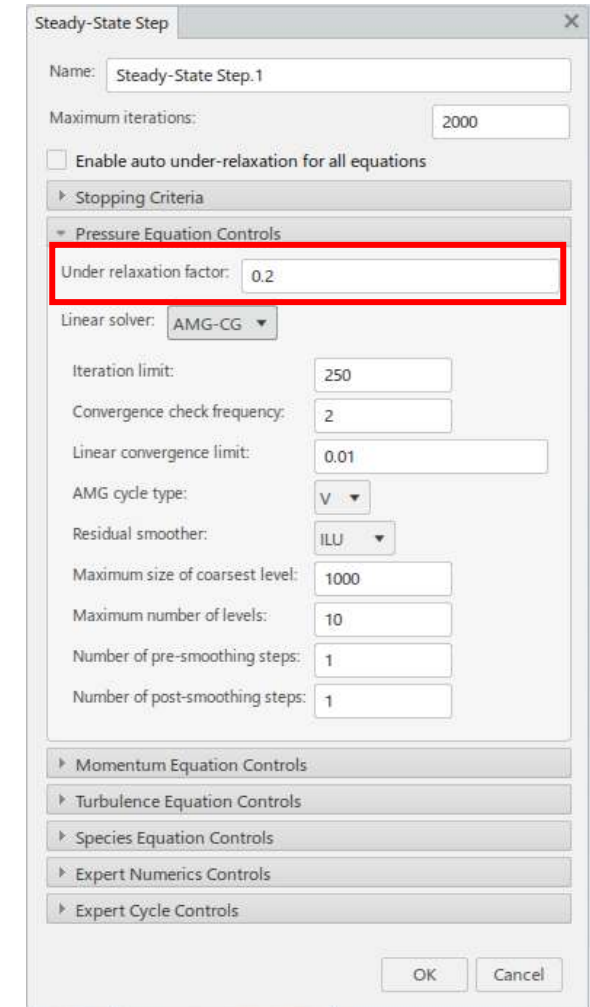
Error Thresholds (%)	
<input checked="" type="checkbox"/> Momentum:	Threshold 1
<input checked="" type="checkbox"/> TKE:	Threshold 1
<input checked="" type="checkbox"/> EPS:	Threshold 1
<input checked="" type="checkbox"/> Species:	Threshold 1

Residual Thresholds (%)	
<input checked="" type="checkbox"/> Momentum:	Threshold 0.1
<input checked="" type="checkbox"/> TKE:	Threshold 0.1
<input checked="" type="checkbox"/> EPS:	Threshold 0.1
<input checked="" type="checkbox"/> Species:	Threshold 0.1

Below the 'Stopping Criteria' section, there are expandable sections for 'Pressure Equation Controls', 'Momentum Equation Controls', 'Turbulence Equation Controls', 'Species Equation Controls', 'Expert Numerics Controls', and 'Expert Cycle Controls'. The 'OK' and 'Cancel' buttons are at the bottom right.

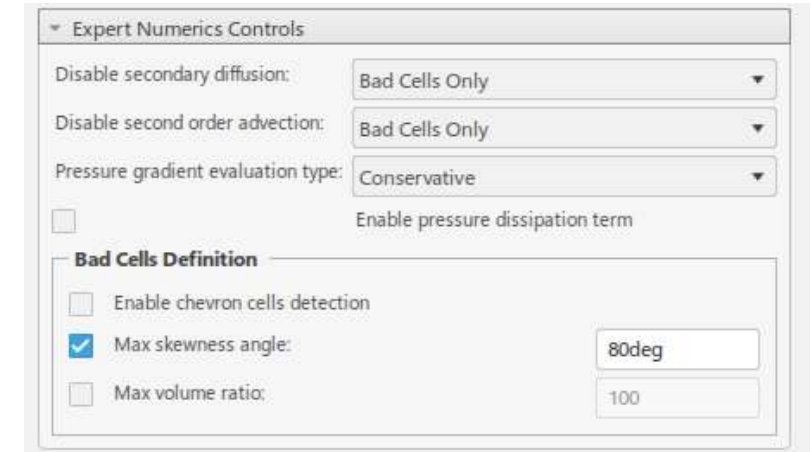
Key Features

- Explicit Model Definition
- Physics
- Meshing
- Solver
 - Residual Criteria or patented error criteria for faster convergence
 - Under relaxation for solver stabilization
 - Related to Courant Number



Key Features

- Explicit Model Definition
- Physics
- Meshing
- Solver
 - Residual Criteria
 - Under Relaxation for solver stabilization
 - Expert Numerical Controls
 - HPC – Up to 144 Cores on Cloud

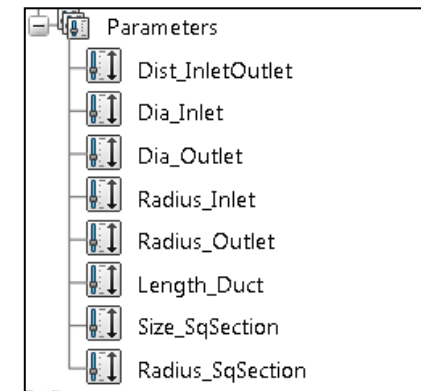
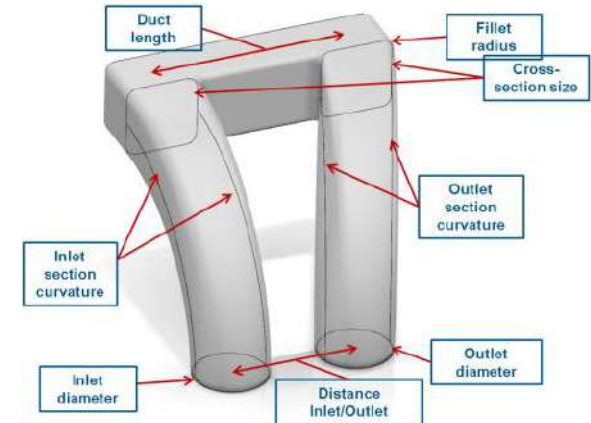


Key Features

- Explicit Model Definition
- Physics
- Meshing
- Solver
- Design Automation*

*Requires multidisciplinary optimization role on 3DEXPERIENCE

Identify Key Parameters

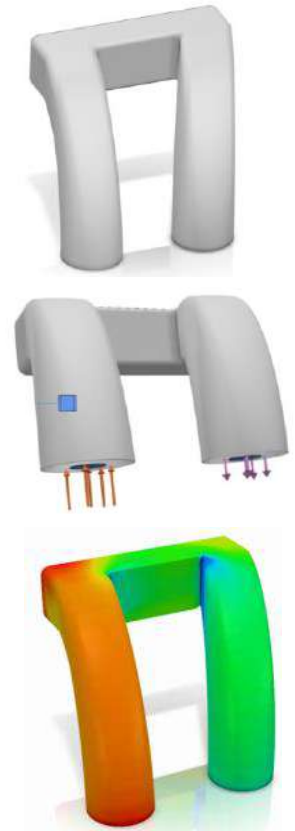


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Setup
Initial



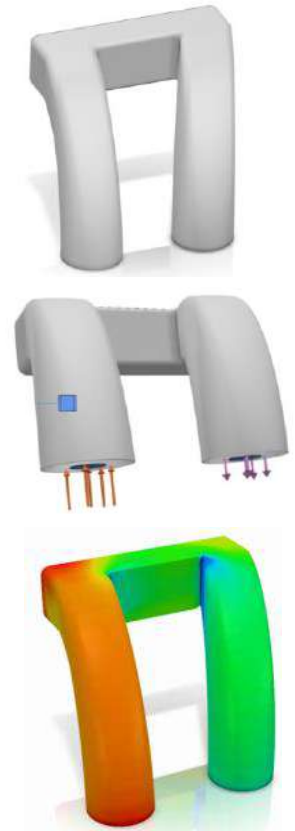
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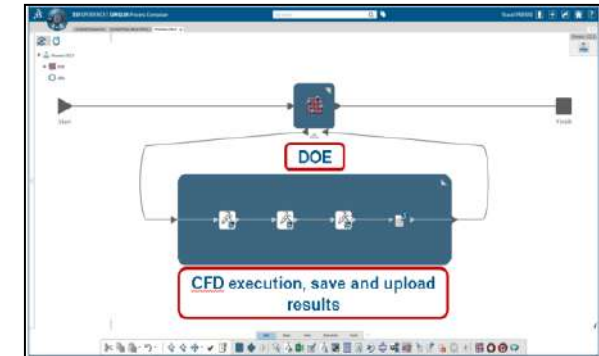
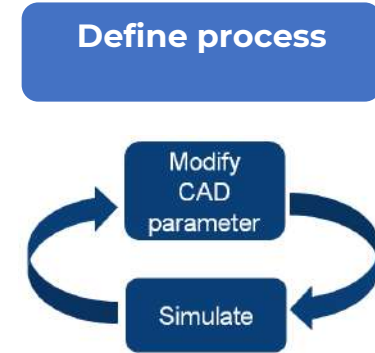
Setup
Initial Simulation



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Key Features

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Key Features

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Review performance
analytics and trade-offs



*Requires multidisciplinary optimization role on 3DEXPERIENCE

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Conclusion

- Deeper control on the models and physics
- Wider range of options for physics
- Automated design optimization
- PLM embedded CFD

Questions?

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Stay up to date on upcoming events & webinars!

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