3DS SIMULIA

3DEXPERIENCE®

XFlow 2019x DATA SHEET

ENGINE

Solver
- Fully Lagrangian kinetic solver—Lattice Boltzmann Method
- Compressible / Enforced incompressible (Labs mode)
- Transient
- 2D / 3D
- Single Phase flow: internal / external (Virtual Wind Tunnel)
- Free surface flow: internal / external (Water channel)
- Multiphase flow with two immiscible fluids: Particle-based tracking / Phase field / VoF
- Discrete Phase Model (DPM)
- Heat transfer: conduction / convection / energy-momentum coupling
- Buoyancy: Boussinesq approximation
- Radiation: surface-to-surface Montecarlo model
- Supersonic flow model (Labs mode)
- XFlow One engine: improved performance for single phase flow
- Turbulence flow: Large Eddy Simulation (LES)
- Subgrid-scale turbulence model: Smagorinsky / dynamic Smagorinsky / Wall-Adapting Local-Eddy (WALE)
- Acoustics: Direct noise computation
- Non-Newtonian viscosity models: Herschel-Bulkley / Power-law / Cross / Carreau / user defined
- Fluid state equations: incompressible / ideal gas / Boussinesq model
- Scalar (species) transport equation - buoyancy effect

Fluid-Structure Interaction (FSI)
- Multibody solver integrated and fully coupled with fluid solver
- Rigid body dynamics: up to 6 degrees of freedom / input mass properties / external forces and moments / automatic contact detection / friction and restitution coefficients
- Enforced: input position and angular laws
- Animated geometry: reading a geometry deformation sequence
- Two-way cosimulation between XFlow and Abaqus (Explicit/Implicit) for FSI analysis
- One-way cosimulation between XFlow and Abaqus (Explicit/Implicit) for FSI analysis with small deformation
- Two-way cosimulation between XFlow and Simpack via FMI standard
- Coupling with external CAE software supporting FMI standard such as OpenModelica
- Import of MSC Adams simulation results into XFlow

Boundary Conditions
- Wall models: no-slip / free slip / turbulent boundary layer / universal wall model
- Immersed boundary method for moving walls treatment
- Inlet: velocity / mass flow / gauge pressure / gauge total pressure
- Progressive wave boundary condition for Water channel
- Outlet: gauge pressure / convective / velocity / velocity / mass flow / gauge total pressure
- Others: fan model / porous jump / porous volume (w/ or w/o heat generation) / periodicity
- Thermal analysis: adiabatic / temperature / temperature jump / heat flux / free convection / convection radiation / volume heat source / conjugate heat transfer / surface emissivity
- Absorbing inlet and outlet boundary conditions (LODI)

USER INTERFACE

General
- Unified working environment: pre-processing / domain generation / run / post-processing in a single Graphical User Interface (GUI)
- Configurable layout: dynamic windows and toolbars
- Advanced real-time graphics visualization
- Integrated ray-tracing and OpenGL post-processing
- Inputs: drop-down multiple-choice list / switch / user defined functions / tabular data
- XML project file format
- Power'By approach to connect XFlow to the **3D**EXPERIENCE® platform, import CAD models to XFlow and upload simulation results on the platform

Pre-Processing
- Easy-to-use setup workflow
- Built-in modules for Virtual Wind Tunnel and Water-channel
- Geometry creation tools: basic-shapes generation / create mesh shape / duplicate shapes and faces
- Geometry modification tools: translation / rotation / scale / symmetry / split / heal / holes detection
- Geometry import: compatible standard formats: CATIA V5 / STEP / STL / IGES / BREP / NFF / NFB / CSFDB / OFF / BDF / Nastran Model
- Direct import of CATIA's CATPart and CATProduct geometries
- Automatic tessellation for parametric geometries
- Domain initialization from previous XFlow computations
- External mesh data import via VTK/VTU format as input laws
- Graphic function viewer for input laws
- User Defined Variables (UDV) inputs
- Symbolic function parser
- Define geometry behavior in an Arbitrary Reference Frame

3DS DASSAULT SYSTEMES

XFlow 2019x DATA SHEET

Domain Generation

- Automatic domain generation (meshless technology) - octree-like grid
- Multi-resolution scheme, refinement criteria: near static walls / adaptive refinement / user defined region (rectangular, spherical, cylinder and tubular refinement regions) / curvature adapted
- Low geometry requirements ("watertight" only)
- Geometry motion and wake/free surface adaptive refinement: domain is dynamically and automatically refined (meshless technology)

Run

- Start computation / Start advanced computation / Start FMU computation / Stop-Resume computation / Restart computation from a previous one
- FMU computation dialog box to perform co-simulations through FMI standard
- Batch mode available - command lines
- Serial multi-threaded computation (SMP)
- Distributed computation - MPI implementation supported: Intel, OpenMPI, MPICH2
- Job schedulers: LSF / SLURM / PBS-Torque / Custom
- Efficient scalability on shared and distributed memory environment

Post-Processing

- Visualization mode: volumetric field / surface field distribution / markers / isocontours
- Visualization utilities: cutting planes / vectors / isosurfaces / stream tracers
- Function viewer for the monitoring of: stability parameter / forces / moments / probes data / mass-momentum integrals
- Post-process operations and measurement: probes and sensors (which can be associated to an arbitrary, even moving, geometry or reference frame), lines measurement, surface integral / volume integral / custom field calculation
- Post-processing tools for signal processing: Power Spectral Density (PSD) + filtering window functions
- Instantaneous, average, standard deviation and RMS data available
- Discrete Phase Model (DPM): spherical particles defined with their materials properties driven by the flow and external accelerations
- Export and import of post-processing setup for quicker analysis of simulation results
- Save XFlow simulation results on the **3D**EXPERIENCE platform for post-processing
- Export data to other formats: raw format / VTK / ParaView / EnSight Gold / CGNS / Surface data Abaqus / XFlow ASCII format / NASTRAN thermal data
- Generate animations from the simulations in video format or as images sequence
- Script and automation: numerical post-processing scripting possibilities (parsing numerical data binary file)

Our **3D**EXPERIENCE® platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

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