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CastNet: OpenFOAM setup and job control for Windows, Linux and Gompute’s cluster environment.

Introduction
CAD model based workflow
CastNet for the Gompute users
CastNet/OpenFOAM-Example case
Conclusion
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CFD-Solutions based on OpenFOAM®-Technology

Engineering:
CFD-Services with OpenFOAM

Software
Standard/Customized:
GUIs, Extensions

User Support Training:
OpenFOAM/our Extensions

This offering is not approved or endorsed by ESI Group, the producer of the OpenFOAM® software and owner of the OPENFOAM® and OpenCFD® trade marks.
Our philosophy: More pragmatic than dogmatic

We have to accept the reality of our customers. Not always but often:

- Commercial CAD systems with proprietary kernels
- Windows systems (IT says “NO” to Linux)
- New software must be productive from the first second
- GUI based working is preferred for certain tasks

Can not be covered with OpenFOAM directly

Combine proprietary solutions with OpenSource

Try to share open source part of work (e.g. OpenFOAM-extensions)

Major tools:

- CastNet: Preprozessor for OpenFOAM
- Rungui for CastNet: Job-Control
Major goals for CastNet:

• Providing access to reliable, robust and high quality CFD-meshing based on CAD geometry (commercial CFD-meshing and CAD import technology)
• Establishing complete GUI based environment: Access to strong OpenFOAM® solution capabilities without editing text files or detail knowledge of keyword-structure (e.g. “turbulentMixingLengthFrequencyInlet” )
• Reducing the time from CAD model to OpenFOAM® run-ready case

Fully compatible: User can switch anytime from GUIs to text-based model setup

User can extend the CastNet model output for specific needs

Helps to learn the usage/keywords of OpenFOAM
Job Control
Workflow

**Geometry Input**
- Parasolid: (Nx, Solidworks, Solidedge,...)
- ACIS: (Inventor, SpaceClaim, TurboCAD,...)
- Granite: Pro-E Creo
- Catia: Translator e.g. SpaceClaim
- Discrete (stl, Nastran)

**Meshing/Case Setup**
- CastNet: CAD Kernel based geometry import: Models/assemblies
  Hybrid CFD-meshing or SnappyHexMesh-definition
  Case setup GUI: More than 30 solvers for 2.0/2.1

**Solving/Job Control**
- Windows: BlueCFD
  - OpenFOAM
  - Job control: runGui
- Linux: ESI-OpenFOAM 1.5-2.1*
  - Job control: runGui

**Post-processing**
- Exchange: CastNet
- Exchange: CastNet
- Local machine/cluster
- Direct export: Gompute Cluster on demand

**Post-processing**
- Paraview, Fieldview, EnSight, Tecplot, (Windows or Linux)
Options for the Gompute User

Combined local/Cluster
Pre-Processing:
Locally Windows/Linux

Running case:
Locally Windows/Linux or move the case to the Gompute Cluster

Cluster only
Pre-Processing (Coming soon)
Using CastNet on cluster (on-demand)

Running case:
Gompute Cluster Job control with Rungui

Exchange CastNet:
No need to decide at the start
Setting CastNet: Entry in CastNet for Pre-Run-Post options

Case setup and solver call is done using Gompute Commands
Running in Gompute environment
Benefit for Gompute users

High flexibility
- Windows/Linux-usage with all exchange options to Cluster/local run

Effective resource management
- Run cases locally for small/medium sized problems or pre-studies
- Switch to Gompute’s HPC environment for higher resources /faster results (transient, design studies, large models…)
- Pre-Processing can be conducted locally e.g. if network-connection is not fast enough for external GUI access
- If memory restrictions occur locally (large mesh cases): Pre-processing can be conducted on the Gompute cluster

Minimized OpenFOAM-care
- No need to keep the Linux OpenFOAM environment up to date (Gompute will care for git-updates)

Optimal support options
- DHCAE Tools can provide support of OpenFOAM usage and CastNet by screen sharing, conference calls etc.
CastNet-Meshing

CastNet / OpenFOAM

- features
- example cases
- technical field
CastNet-Meshing

Dryer with rotating zones (MRF-Regions) Pro-E assembly

By courtesy of Whirlpool
CastNet-Meshing
Chemical plant engineering
Meshing setup and OpenFOAM case definition
Chemical Engineering

Come to results rather in days than weeks
Chemical Engineering

- Plates with holes
- Chamber separators (internal walls)
- Filters
Geometry several hundred parts transferred into non-manifold model
Mesh cases 20-30 Mio Cells
CastNet-Meshing

Based on Parasolid-assembly:
• Parts are transferred into regions
• Conformal mesh transition

Usage of extrude regions to avoid tetrahedral elements

Example: Quench
Boundary Layer from extrude to free mesh regions
Temperature distribution

OpenFOAM

Other CFD Solver
SnappyHex-Mesh Support

OpenFOAM internal Mesher: Hex-dominated Polyhedral Cells
CAD model based SHM setup

- Region support (e.g. porous or MRF) based on CAD geometry
- AMI support for sliding meshes
- Local initial conditions for CAD regions
- Manual or automated feature edges
- CAD related edge refinement
- CAD model related face refinement
- Volume region refinement with primitive geometry or CAD regions
- Boundary layer meshing
Transient particle transport in steady flow

performed by DHCAE
CastNet: Complete GUI based workflow of OpenFOAM allowing a flexible usage:

- CAD model based case setup
- CFD meshing
- solving
- graphical job control and
- post processing.

For complex physics and complex geometry

In the Gompute environment or stand-alone

Demonstration: Please visit our booth!