Applications and Development of SALOME for CFD
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FLUID SOLUTIONS  
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1. Renuda
• **Who are we?**
A fully independent engineering company specialised in CFD methods and applications: fluid dynamics, heat transfer, chemical reactions and mechanical calculations. We are based in the UK and in France.

• **How can we help you?**
Our expertise in CFD provides you with Fast – Cost Effective – Accurate solutions.

**IF THERE IS FLUID IN YOUR PROCESS WE CAN HELP YOU**

**CFD Consultancy**
WE TRANSFER KNOWLEDGE, NOT JUST RESULTS.

**Computing**
WE CREATE USER-FRIENDLY, INNOVATIVE APPLICATIONS, NOT JUST CODE.
Industries and Applications

- Renuda delivers effective and creative solutions to clients in industries as varied as oil and gas, rail or manufacturing.
- Our commitment to our clients has led to high client satisfaction resulting in 100% repeat business.

Renuda's expertise, multiphysics skills and knowledge

INDUSTRIES

Automotive
Rail
Oil and Gas
Civil Engineering
Food processing
Energy, etc.

APPLICATIONS

Turbulence
Combustion
Multiphase
Heat transfer
Thermal comfort
Turbo machinery
Power plants, etc.
2. SALOME applications for CFD
Trends in CFD Simulations

- Increase in simulation size and complexity
- Increase in CFD utilisation within organisations
- Parallel simulations on multiple cores
- Requirement for faster and larger computers
  - High Performance Computing (HPC)
- Requirement for efficiency and to control costs
  - Computing
  - Software licensing ➔ High Quality Open Source chains to replace commercial software - SALOME
SALOME for CFD Activities

- SALOME provides commercial-class functionalities for CAD, meshing and visualisation
  - Industrial projects
  - Renuda projects

- Industrial projects
  - EDF R&D
  - ALSTOM Transport

- Renuda projects
  - CAD generation for industrial applications
  - TGV passenger car
  - Francis turbine
  - Industrial furnace
Applications – ALSTOM Transport

• Testing and validating open source calculations chains
  • CAD cleaning and closing using SALOME
  • Modelling thermal comfort in an Amsterdam metro passenger car
Applications – Renuda

- Testing and validating open source calculations chains
  - CAD generation using SALOME
  - Modelling the flow in a hydraulic turbine
Applications – Renuda

- Testing and validating open source calculations chains
  - CAD generation using SALOME
  - Thermal comfort in a TGV passenger car
Applications – Renuda

- Testing and validating open source calculations chains
  - CAD generation using SALOME
  - Thermal comfort in a TGV passenger car
3. SALOME software development for CFD
SALOME Development

• As an Open Source, modular application-hosting environment SALOME offers a powerful base to
  • Build specialised, custom applications, such as GUIs
  • Integrate other modules or sub-modules, such as meshers

• GUI creation: on behalf of EDF SEPTEN
  • Dedicated to a specific type of simulations: steam turbines
  • Expert system not expert users
  • Create a user friendly, integrated environment
GUI Development

- Development is taking place at SALOME modules source code level, not as a plug in, or Python scripts or EFICAS

- Self-standing application built on elements of SALOME but independent from SALOME

- Programming in modules
  - GUI
  - GEOM
  - SMESH
GUI Development (2)

- Designed and implemented a different structure to GEOM
  - Top-down' approach as opposed to GEOM’s ‘Bottom-up’
  - Constituent parts which are meaningful for the application rather than topological:
    - Hub
    - Casing
    - Stages
    - Blades
    - etc.
  - Ability to edit the created parts upon visual inspection
• Import and automatic construction of vertices
• Manual functionalities specialised to turbine parts implemented as well
GUI and GEOM Example (2)

- New, default 2D, OCC view for visualisation in the meridian plane
- Tree structure implemented to categorise points by part type

(1) Automatic recognition and categorisation according to the type of part

(2)
Module Component Integration

- Mesher integration: SALOME for CAD, GUI, and visualisation

Very Large Commercial CFD Validation Project on Blue Gene/Q © Copyright 2013 Renuda®
Renuda’s Research Program enabled by the Hartree Centre Blue Gene/Q Extended Access Program
• SALOME represents a high-quality alternative to commercial software for CAD

• For CFD, meshing capabilities may not always be sufficient at the moment

• Open source and base features make it very attractive

• Development of unique applications

• Integration of own software

Innovate and fly away with SALOME and Renuda