

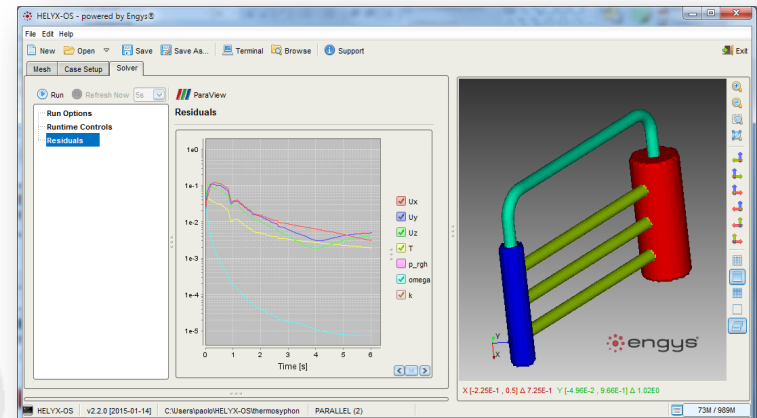
Introducing HELYX-OS, an Open-Source Graphical User Interface for OpenFOAM®

Paolo Geremia

Workshop HPC enabling of
OpenFOAM for CFD
applications@Cineca
25-27 March 2015

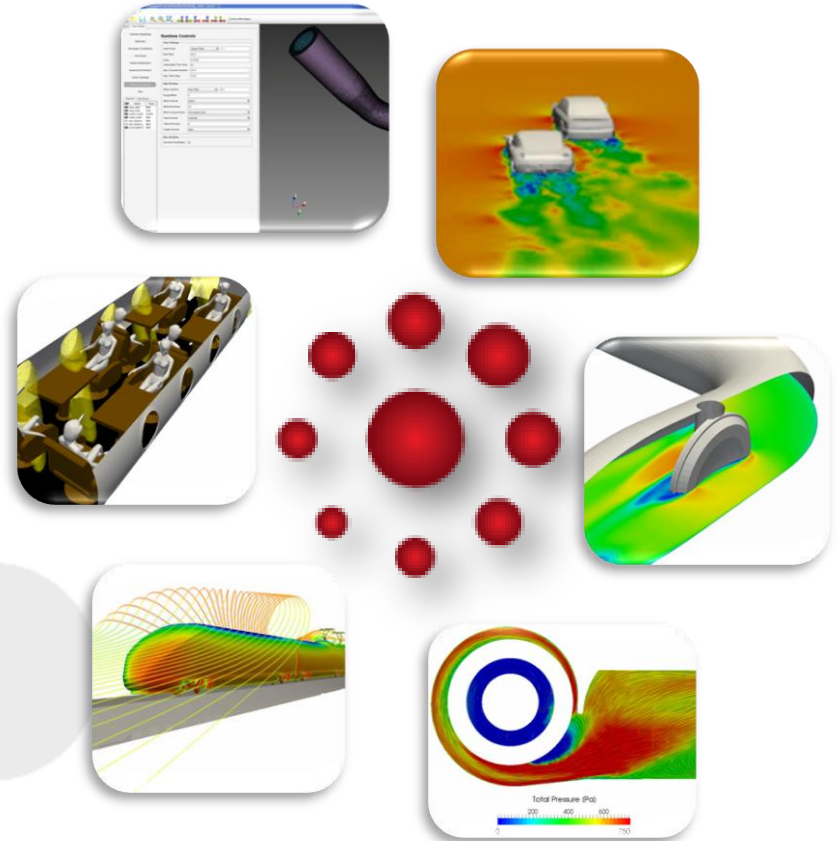
Cineca - Casalecchio di Reno (BO)

HelyxOS



Contents

- ENGYS
- Introducing HELYX-OS
- History and Future Plans
- Work in Progress
- Closing



ENGYS | Company Details

- CAE products and services
- Focus on Open Source solutions
- Technology platforms:
 - CFD → OPENFOAM®
 - Optimisation → DAKOTA
 - GUI → HELYX®
- History:
 - 2009 → founded in the UK
 - 2010 – present → 5 offices worldwide
 - 2012 → Joint Venture with ARC
(Streamline Solutions)
 - 2013 → resellers Japan and Benelux



ENGYS | Products & Services

PRODUCTS



HELYX



HELYX-OS



ELEMENTS

SERVICES

**OPENFOAM® &
HELYX
Support &
Training**

**Analysis, Design,
Consultancy**

**HPC
On Demand**

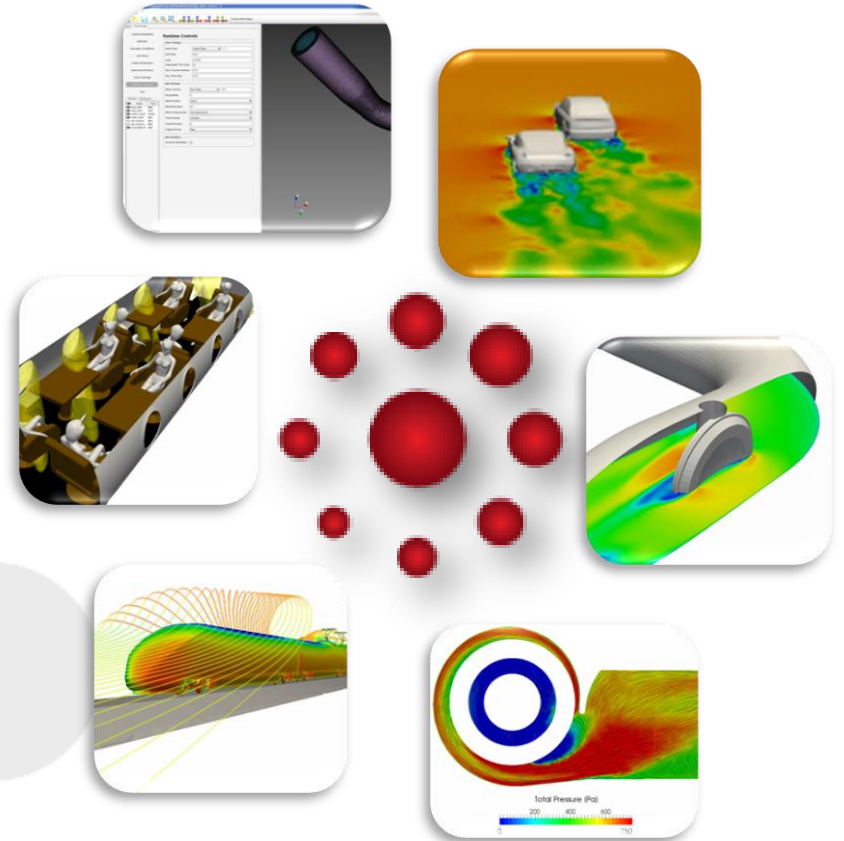
**OPENFOAM® &
HELYX
Development &
Customization**

**Adjoint CFD
Optimisation
Development &
Consultancy**

**DAKOTA
Optimisation
Support &
Training**

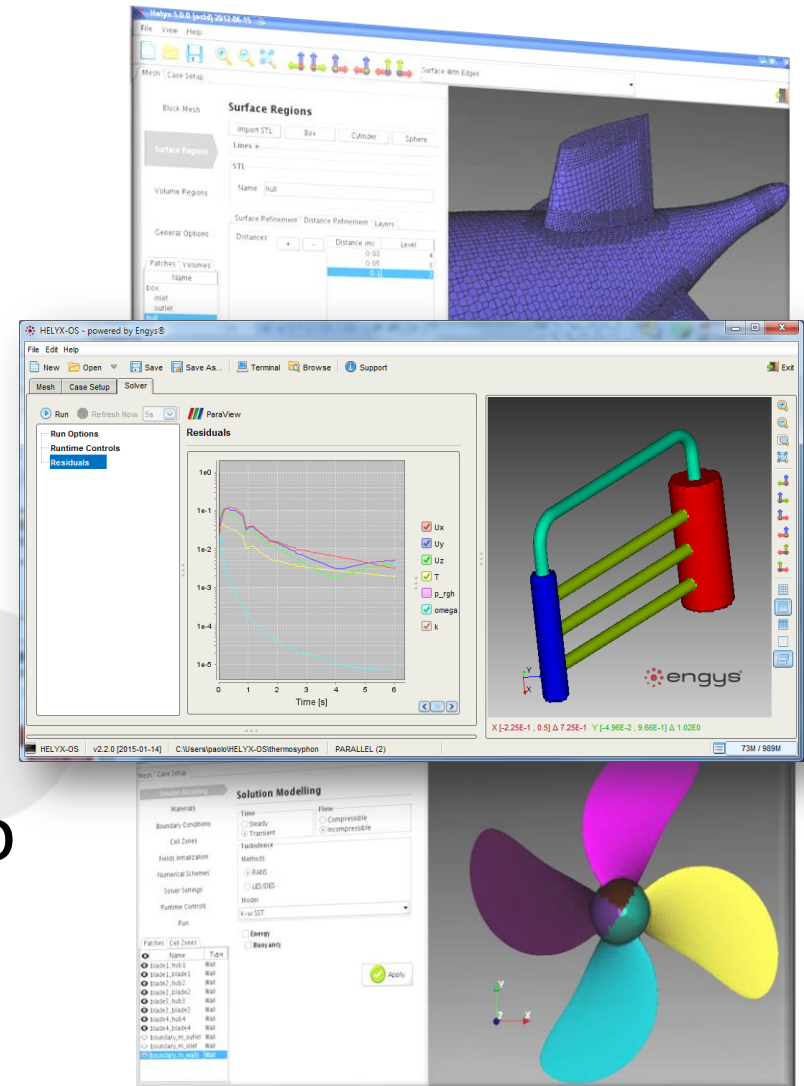
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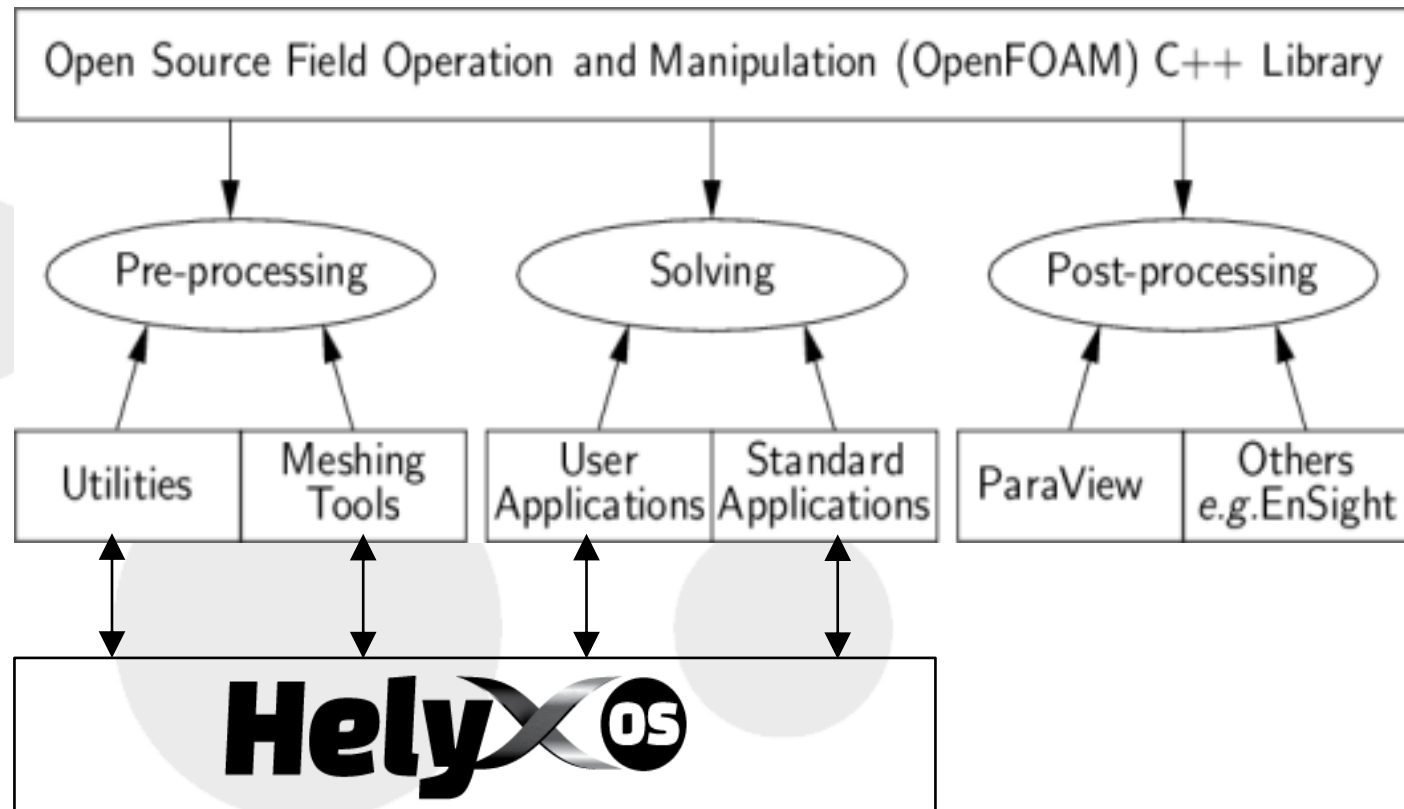


What is **HelyxOS** ?

- Open Source GUI for easy pre-processing of cases in OpenFOAM v2.3.x
- Developed and maintain by Engys (Java + VTK)
- Free to download via SourceForge
- Over 80,000 downloads to date worldwide

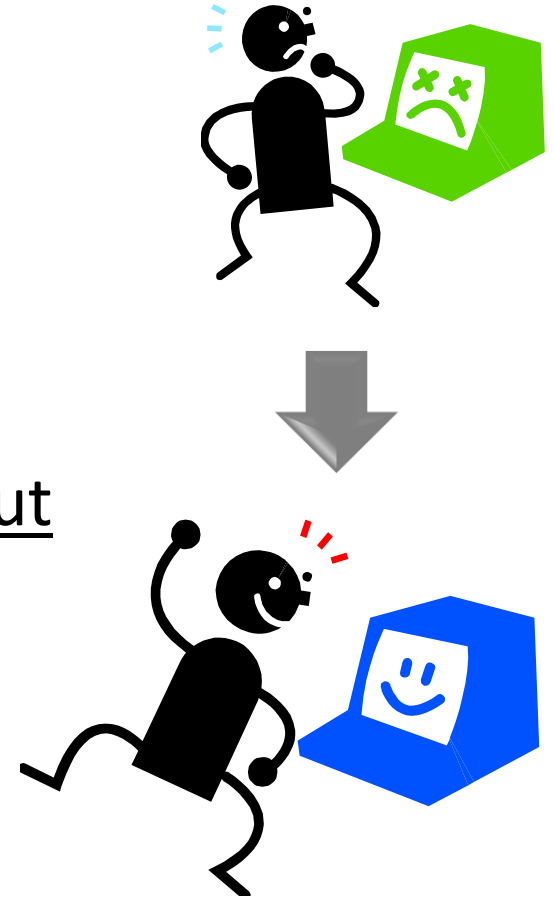


What is **Helyx^{OS}** ?



Why do we need **Helyx** OS ?

- “;” → small mistakes can be fatal
- User centric product
 - Good software + Bad interface = Bad experience
- Fit for application
 - Freely available code provides tools but HELYX-OS provides solutions



HelyxOS | Current Key Features

- Native read/write of OpenFOAM® files
- Geometry and mesh interactive 3D visualisation
- Mesh tab → controls for *snappyHexMeshDict*
- Setup tab → controls *system* and *constant* files
- Solver tab → allows execution and monitoring of solver run
- Solvers
 - Single phase incompressible flows + MRF + porous
 - Single phase compressible flows + MRF + porous
 - Single phase buoyancy based solvers
 - Multiphase VOF solver
- Direct Mesh and Solver execution within GUI

HelyxOS | Layout Overview

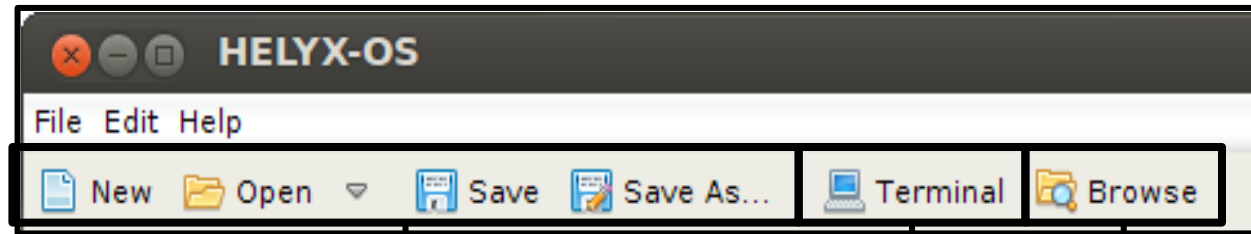
The screenshot displays the HelyxOS software interface, which is powered by Engys. The interface is divided into several panels and bars:

- Menu Bar:** Located at the top left, containing 'File', 'Edit', and 'Help'.
- Toolbar:** Located at the top right, containing icons for 'New', 'Open', 'Save', 'Save As...', 'Terminal', 'Browse', 'Support', and 'Exit'.
- Mesh Panel:** Located on the left side, containing tabs for 'Mesh', 'Case Setup', and 'Solver'. It includes a 'Create' button, a 'Check' button, and an 'Options' button. The 'Base Mesh' section is active, showing a tree view with 'Geometry' (containing 'box', 'wall-ceiling', 'wall-floor', 'inlet', 'outlet', and 'walls') and 'Base Mesh' settings (Base Mesh Type: Automatic, Base Mesh Spacing: 0.1, Bounding Box Faces: Face Name, Number of Layers: 0).
- Standard Output Panel:** Located below the Mesh Panel, displaying a terminal window with the following output:

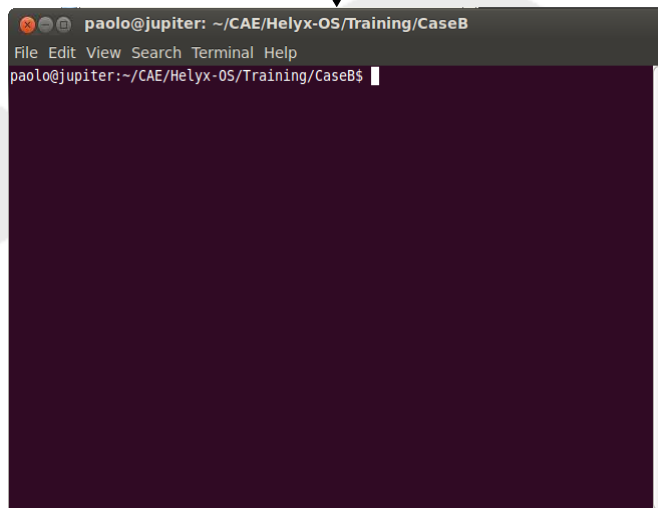
```
polyhedra: 24757
Breakdown of polyhedra by number of faces:
faces  number of cells
4      987
5      1028
6      3481
7      8362
8      2729
9      5335
10     165
11     62
12     1666
13     13
14     21
```
- 3D Viewport:** Located on the right side, showing a 3D visualization of a meshed box with a central hole. The mesh is colored red and blue. A coordinate system (X, Y, Z) is visible at the bottom left of the viewport.
- Memory Panel:** Located at the bottom right of the 3D Viewport, displaying memory usage information: 'X [-1.00E-1, 3.60E0] Δ 3.70E0 Y [-3.08E-4, 1.5] Δ 1.50E0'.
- Info Bar:** Located at the bottom of the interface, displaying 'HELYX-OS v2.1.0 [2014-06-05] D:\CAE\HELYX\Training\CaseB\room PARALLEL (2) 62M / 989M'.

- The **Data Panel** consists of the Mesh tab, the Case Setup and the Solver tab:
 - The Mesh tab controls all the steps required for creating a hexa-dominant mesh
 - The Case Setup tab controls all the settings and parameters needed to complete the definition of the CFD run
 - The Solver Tab allows the user to execute a specific solver, monitor the solution and export the results for visualisation via third-party software.

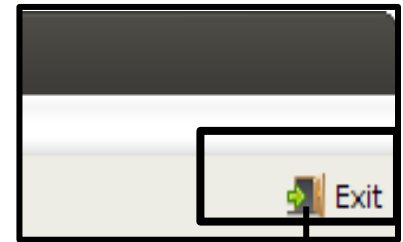
Helyx^{OS} | Main Toolbar



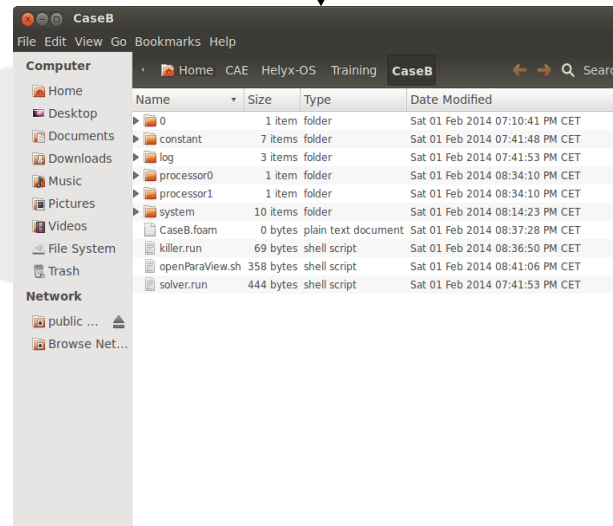
File commands



Open OPENFOAM[®]
terminal



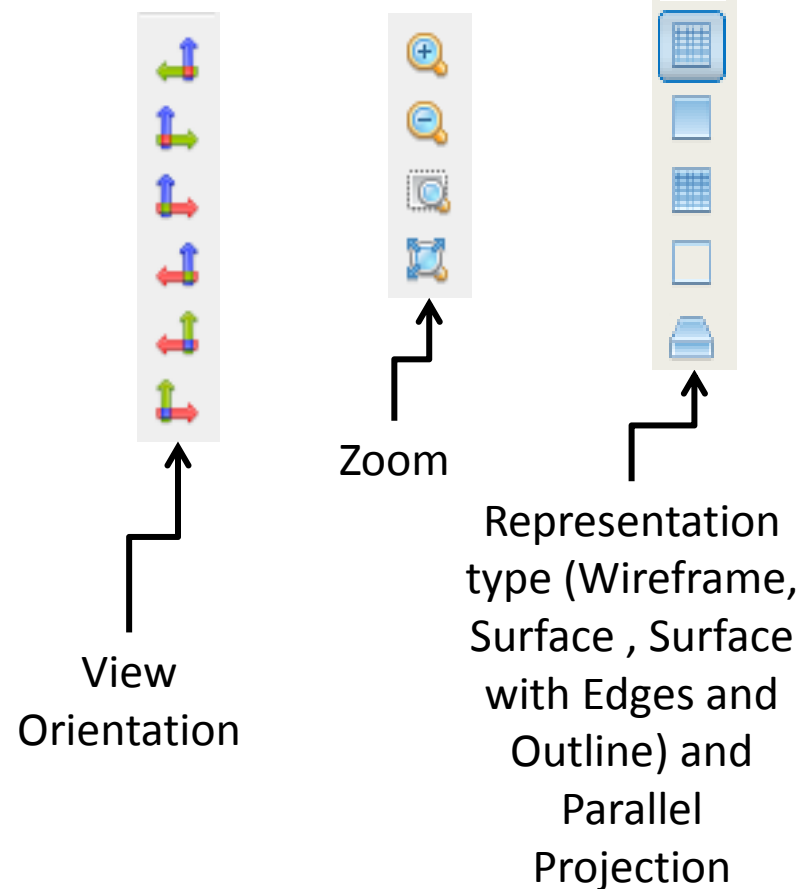
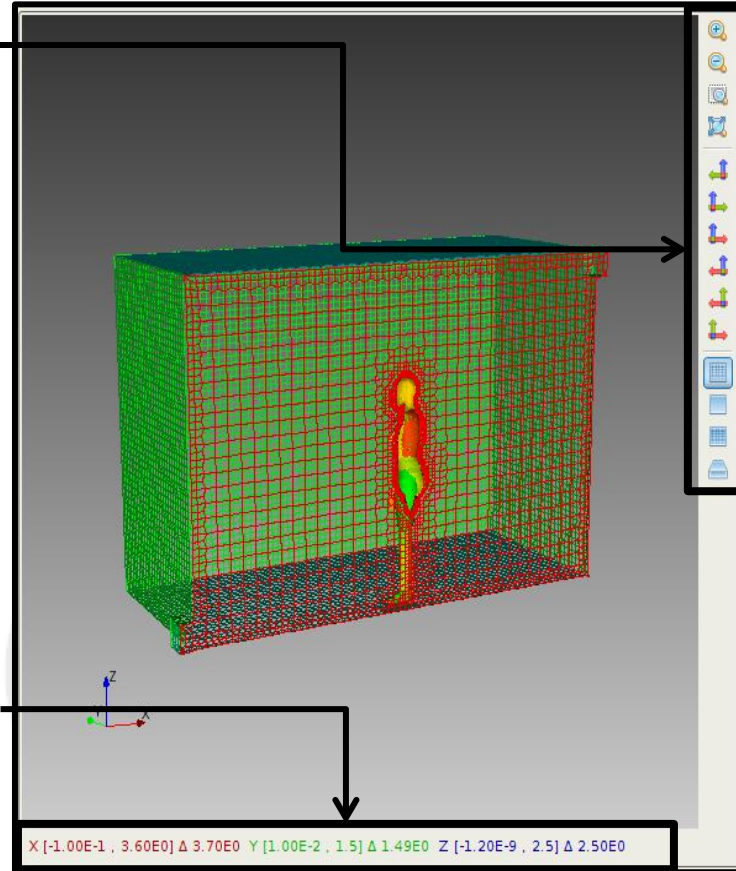
Exit HELYX



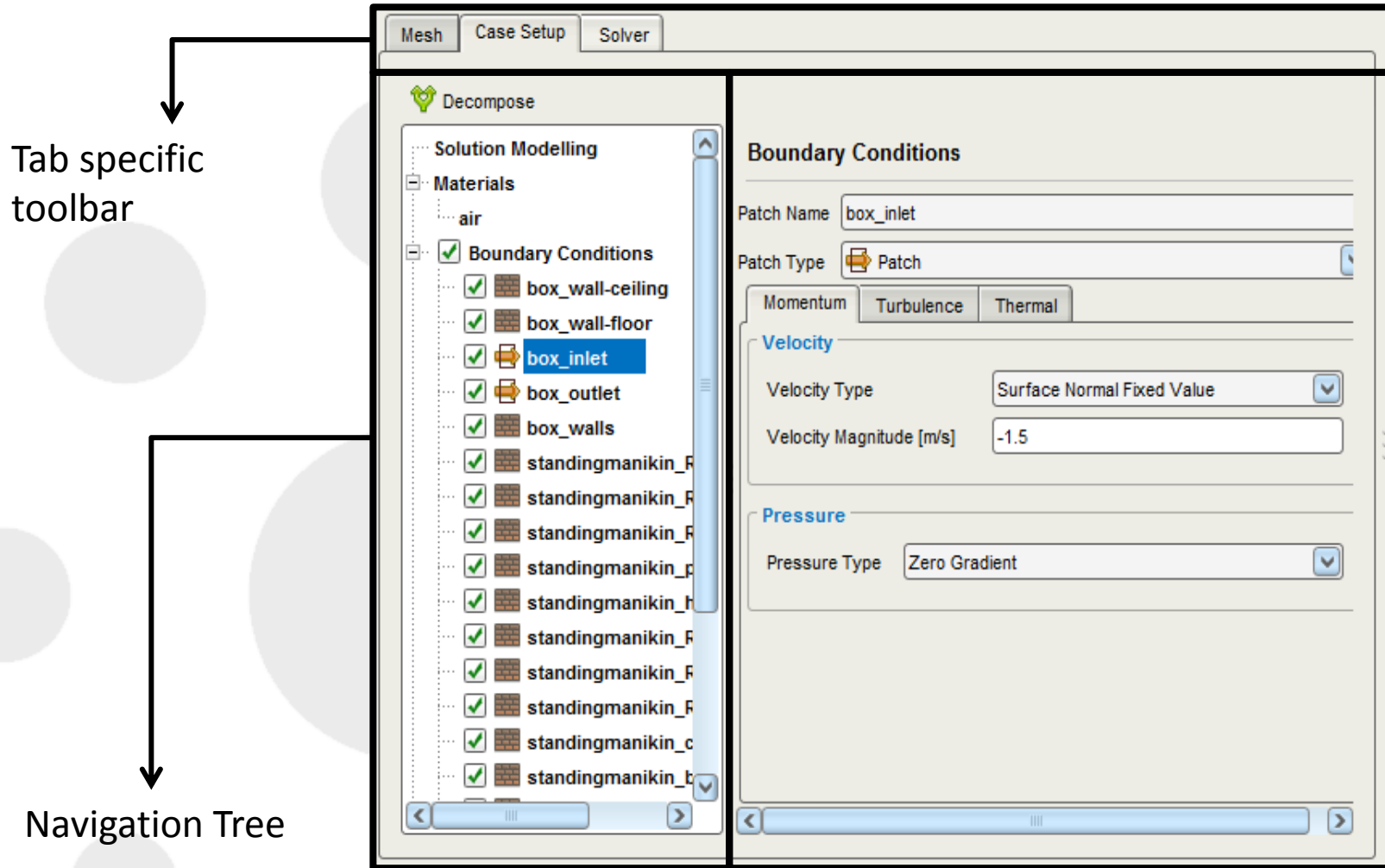
Open case folder

Visualisation
Toolbar

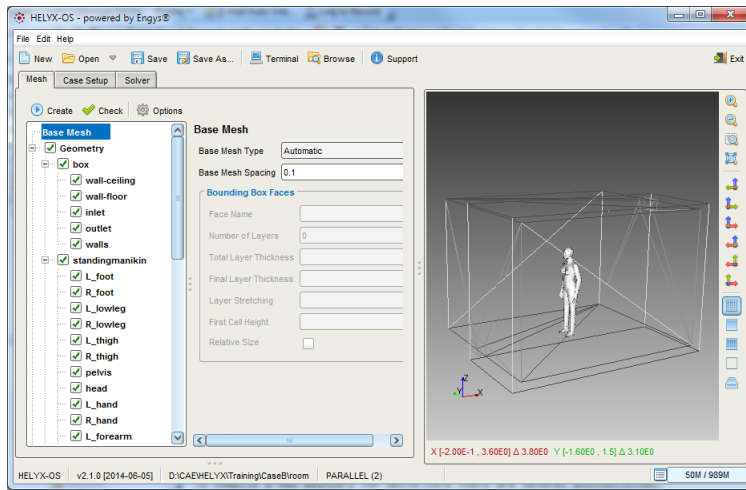
Bounding
Box
Coordinates



- The **Viewport** is a 3D window based on VTK library capable of displaying geometry surfaces, wire-frame or surface with edges representations.

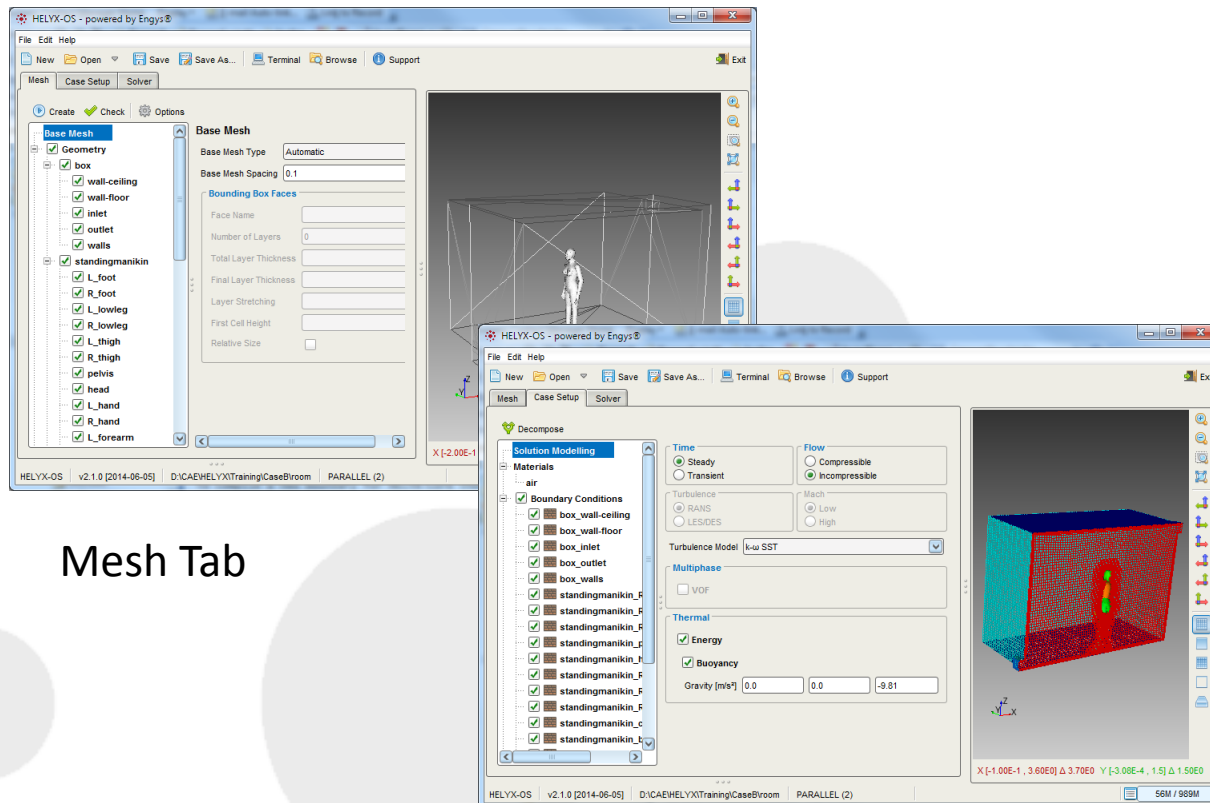


HelyX^{OS} | Workflow



Mesh Tab

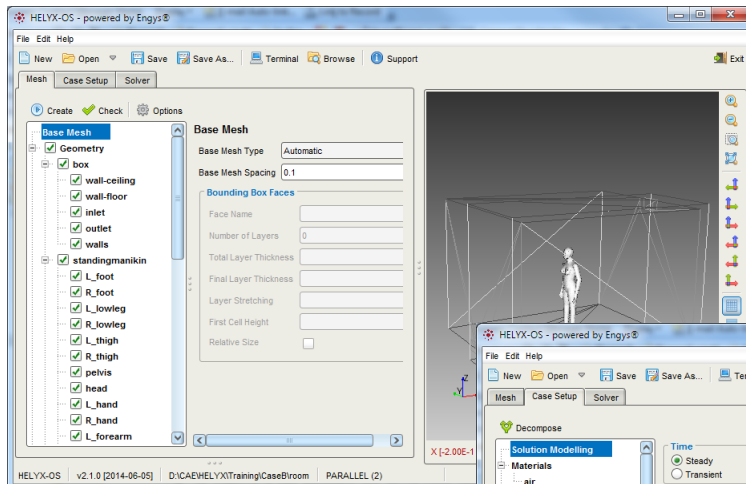
HelyX^{OS} | Workflow



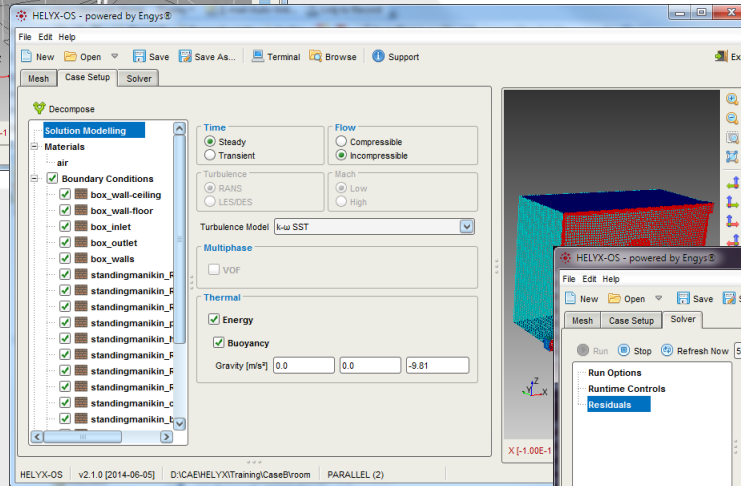
Mesh Tab

Case Setup Tab

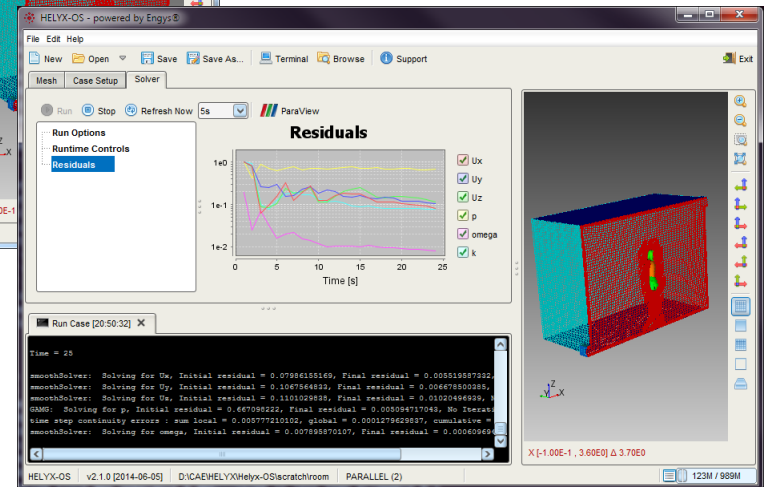
HelyX^{OS} | Workflow



Mesh Tab



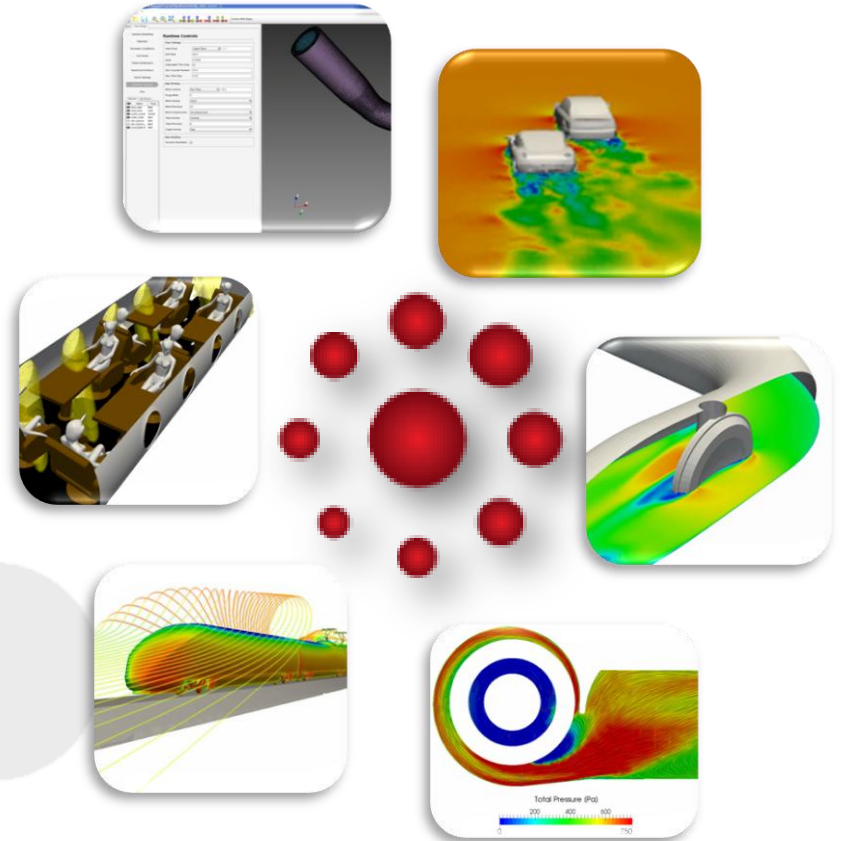
Case Setup Tab



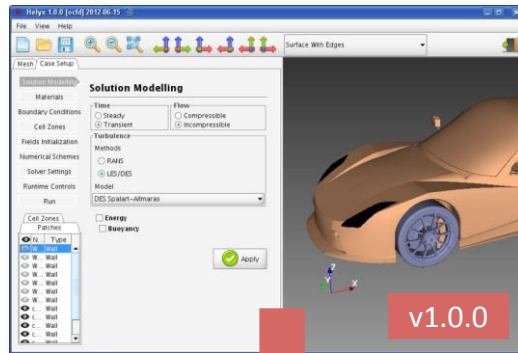
Solver Tab

Contents

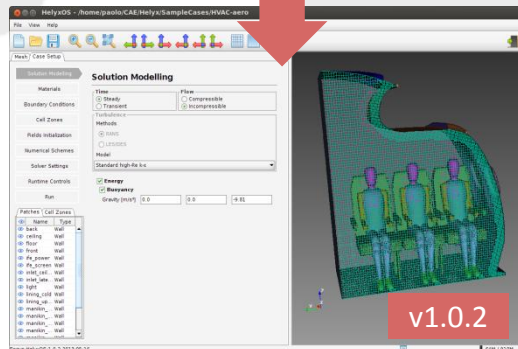
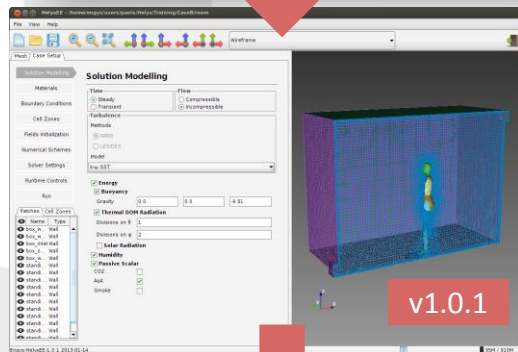
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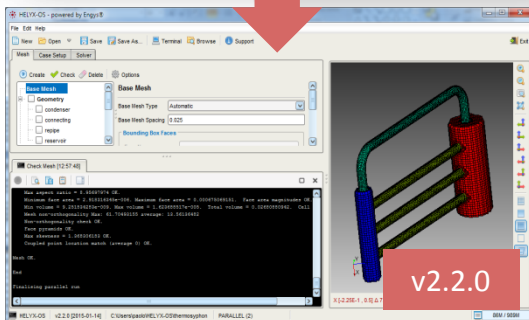
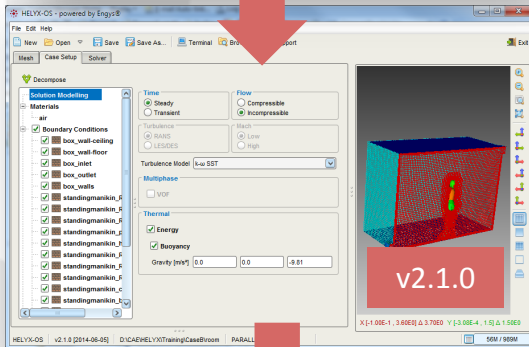
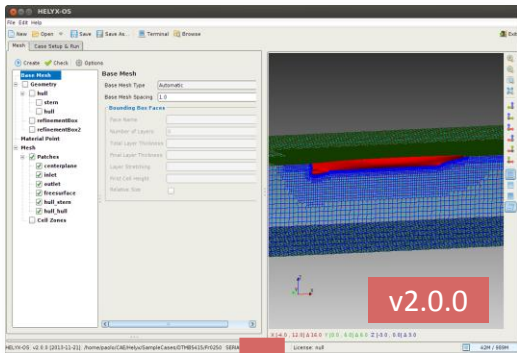
HelyxOS | Achievements



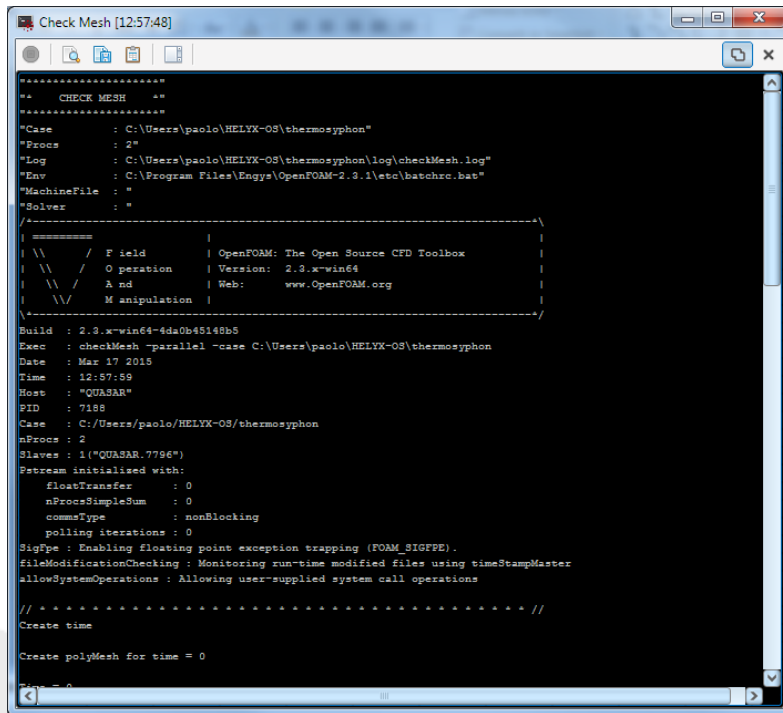
- v1.0.0
 - Initial Beta release
 - Basic functionalities
- v1.0.1
 - Maintenance release
 - Better geometry and mesh creation
 - Improved Setup and visualisation
- v1.0.2 – v1.0.3
 - Added support for OpenFOAM v2.2.x
 - New custom run scripts
 - New turbulence models and discretisation schemes



HelyxOS | Achievements



- v2.0.x
 - New tree layout
 - Enhanced GUI
 - VOF solver support
- v2.1.x
 - Support for OPENFOAM® v2.3.x
 - New solver tab
 - Windows portability
 - New highly compressible solvers support
- v2.2.x
 - Minor release with enhanced functionalities



```
Check Mesh [12:57:48]
=====
-- CHECK MESH --
=====
"Case       : C:\Users\paolo\HELYX-OS\thermosyphon"
"Procs      : 2"
"Log        : C:\Users\paolo\HELYX-OS\thermosyphon\log\checkMesh.log"
"Env        : C:\Program Files\Engys\OpenFOAM-2.3.1\etc\batchrc.bat"
"MachineFile : "
"Solver     : "

-----
|=====|
| \ \ /  F ield      | OpenFOAM: The Open Source CFD Toolbox |
| \ \ /  O peration  | Version:  2.3.x-win64                  |
| \ \ /  A nd        | Web:      www.OpenFOAM.org             |
| \ \ /  M anipulation|                                     |
|=====|
Build : 2.3.x-win64-6da0b45148b5
Exec  : checkMesh -parallel -case C:\Users\paolo\HELYX-OS\thermosyphon
Date   : Mar 17 2015
Time   : 12:57:59
Host   : "QUASAR"
PID    : 7188
Case   : C:\Users\paolo\HELYX-OS\thermosyphon
nProcs : 2
Slaves : 1 ("QUASAR.7796")
Pstream initialised with:
  floatTransfer      : 0
  nProcsSimpleSum    : 0
  commType           : nonBlocking
  polling iterations : 0
SigFpe : Enabling floating point exception trapping (FOAM_SIGFPE).
fileModificationChecking : Monitoring run-time modified files using timeStampMaster
allowSystemOperations : Allowing user-supplied system call operations

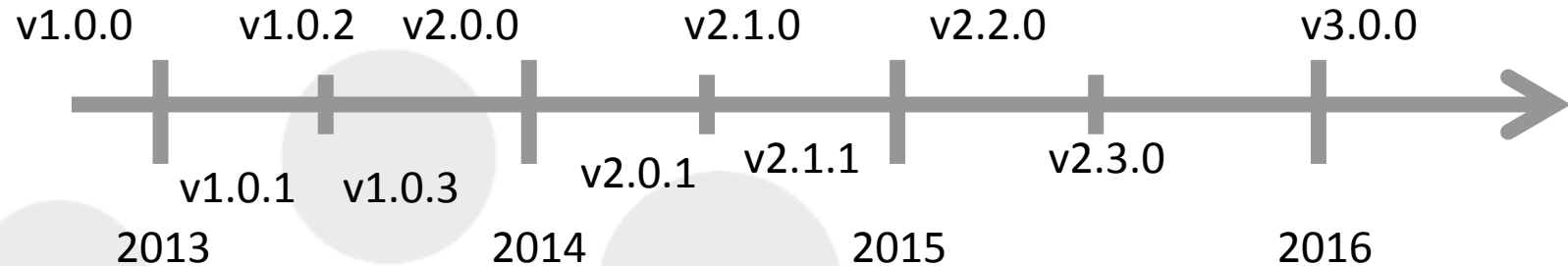
// *****
Create time

Create polyMesh for time = 0

poly = 0
```

- Improved Output Panel:
 - Hard/Soft Kill Scroll Lock (Stop Button)
 - Log to clipboard and log files
 - Scroll lock

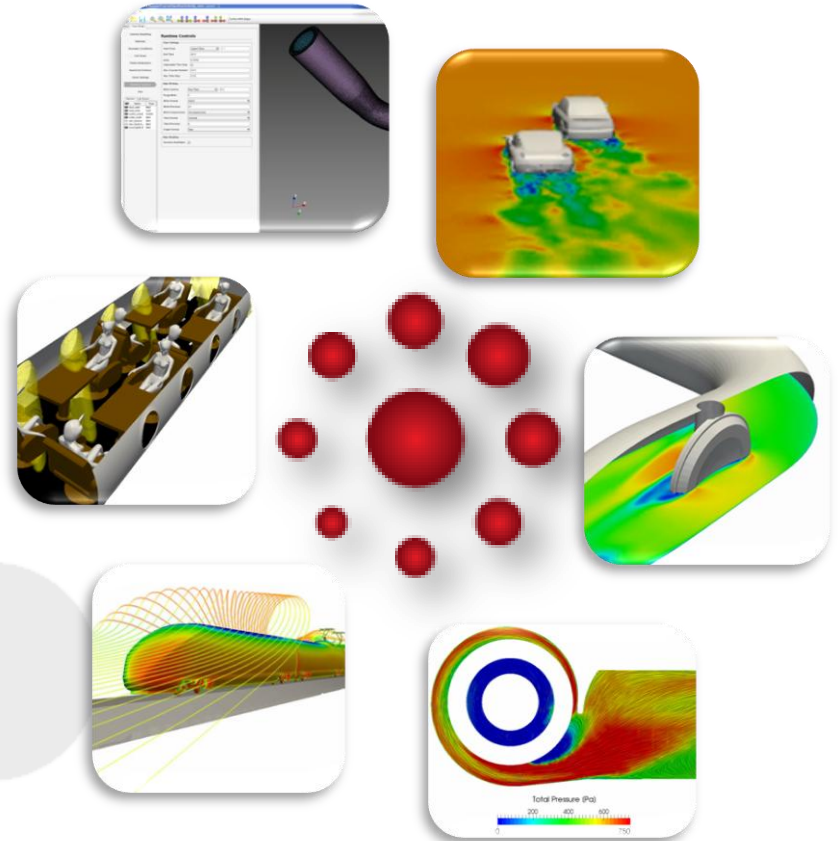
HelyxOS | Release Roadmap

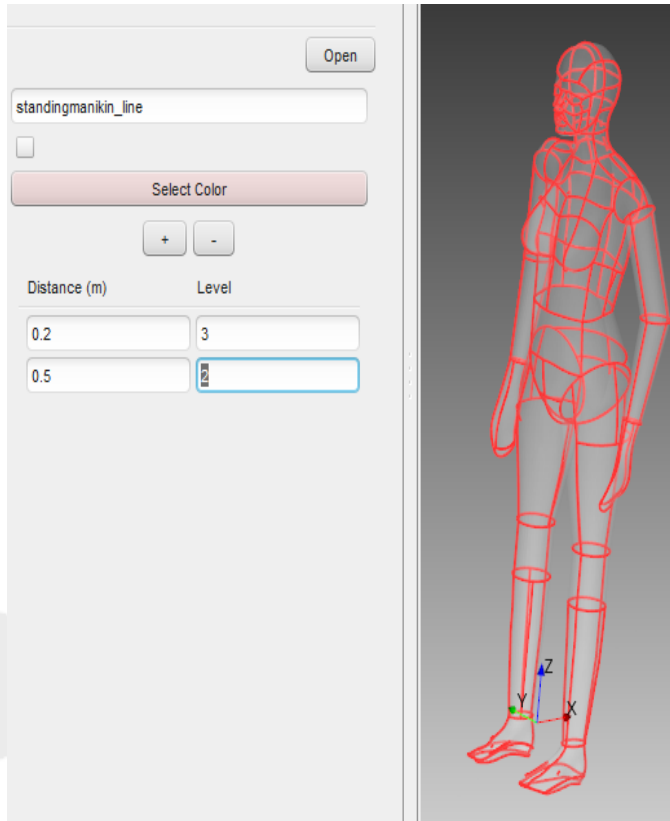


- Short term targets
 - Improved mesh interface
 - Custom section for advanced editing of dictionaries
- Mid-term targets
 - Support for HPC systems
 - Support for new solvers and physical models
 - Extended functionalities

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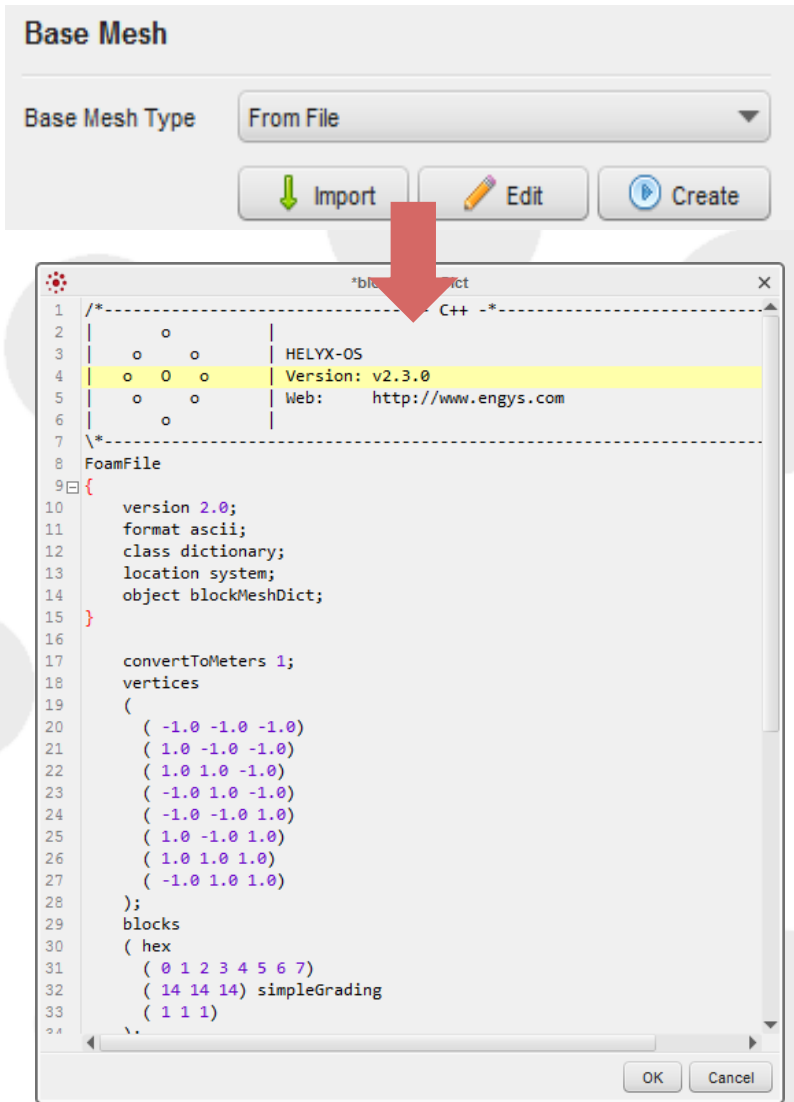
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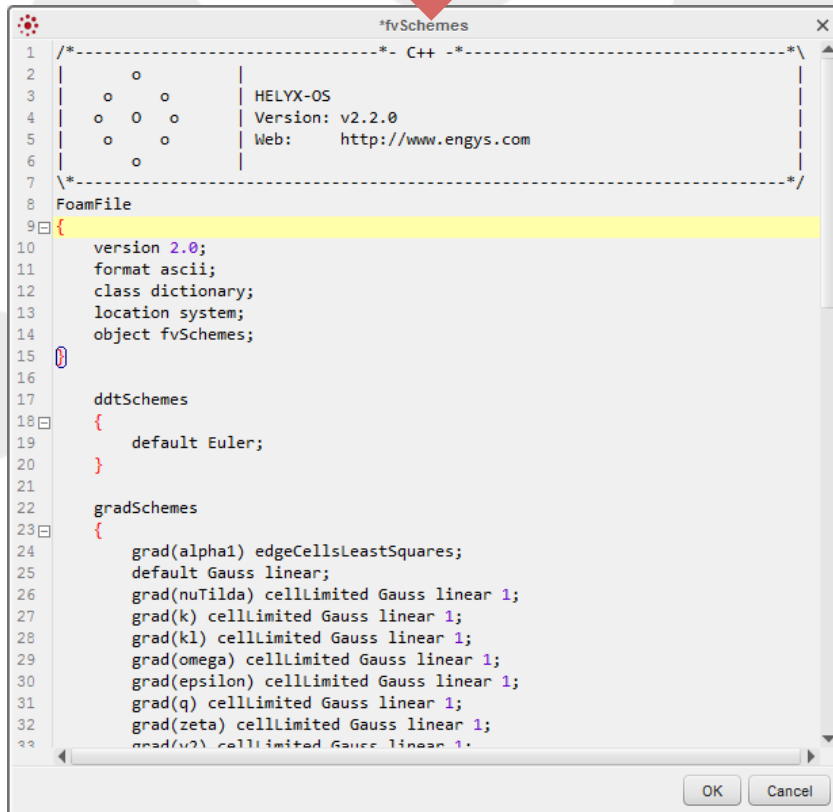
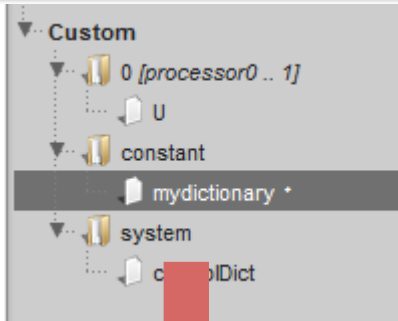




- Feature lines visualisation in the GUI created via external utilities (e.g. `surfaceFeatureExtract`)
- Feature line distance-based refinement

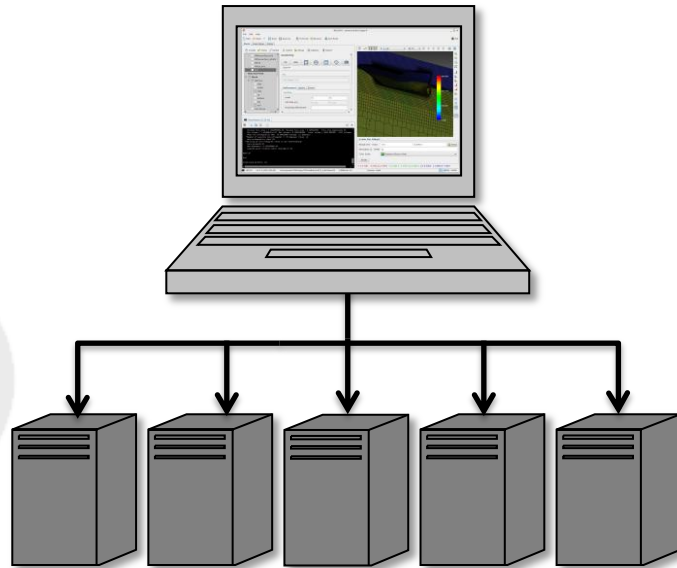
- Custom base mesh option to allow import of user-defined blockMeshDict dictionary file



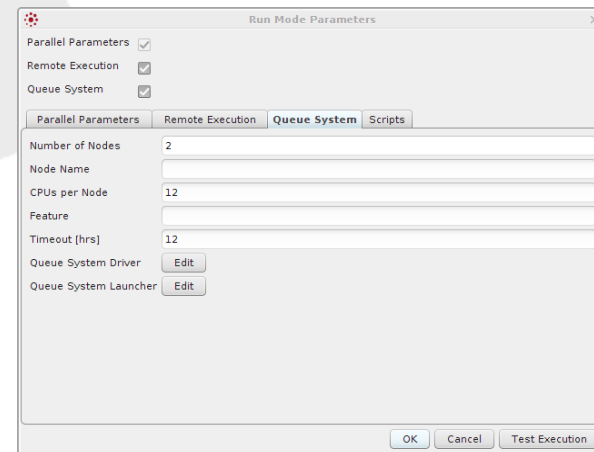


- New Custom section in Case Setup tab:
 - Edit new/existing dictionaries inside *constant* and *system*
 - Edit new/existing fields inside the *0* time folder (parallel and serial)
 - Merge or raw file options

- New cloud interface for parallel execution:
 - Execution of HELYX-Core on a local and/or remote cluster
 - Support queue system for job scheduling
 - Remote monitoring job log, residuals and monitoring functions

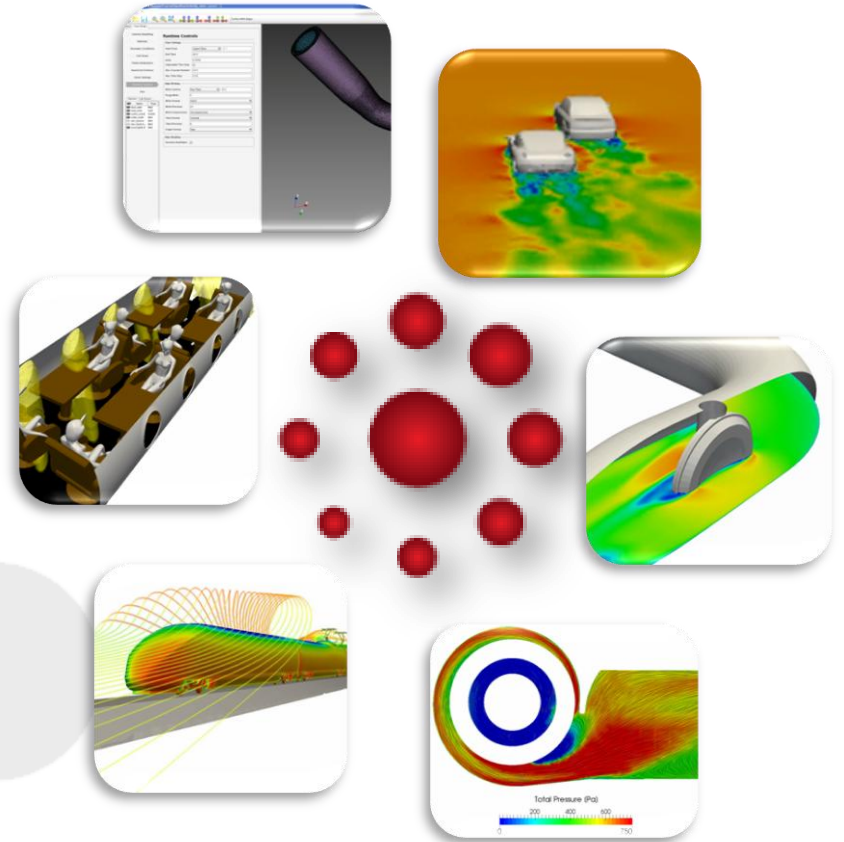


Execution Machines



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Closing

- Why using HELYX-OS?
 - Interface designed by users, for users
 - Maintained by FOAM/OpenFOAM® experts (developing FOAM since 1999)
 - Linux and Windows ports (both GUI and core)
 - Open to 3rd party developers (plug-ins)
 - Best value!

THANK YOU VERY MUCH!

Questions?