

# SymLab

## An Interactive Simulation Environment for OpenFOAM

**Richard Smith, Symscape**

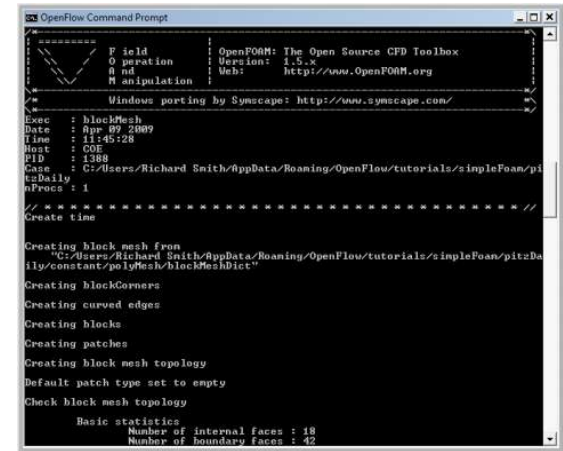
[www.symscape.com](http://www.symscape.com)

4<sup>th</sup> OpenFOAM Workshop

June 2-4, 2009, Montreal, Canada

# Outline

- SymLab
- OpenFOAM
- OpenFOAM Solver
- SymLab RANS Flow
- SymLab RANS Flow Examples
- Summary



```
OpenFlow Command Prompt
-----
File Id      : OpenFORM: The Open Source CFD Toolbox
Operation    : Version: 1.5.x
Name        : Web: http://www.OpenFOAM.org
Manipulation

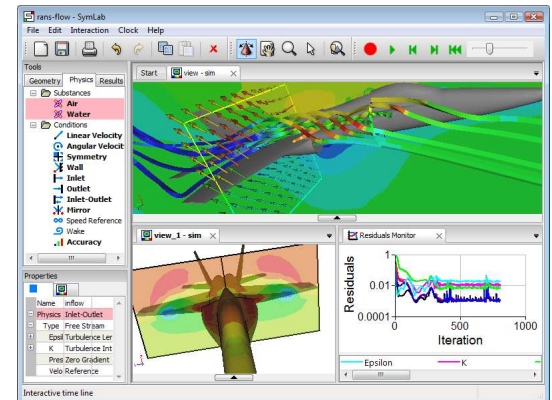
Windows porting by Symscape: http://www.symscape.com/

Exec      : blockMesh
Date      : Sun 09 2009
Time     : 11:45:28
Host     : ODE
PID      : 1388
Case     : C:/Users/Richard Smith/AppData/Roaming/OpenFlow/tutorials/simpleFoam/pitche
Daily    :
nProc    : 1

*****
Create time

Creating block mesh from
  "C:/Users/Richard Smith/AppData/Roaming/OpenFlow/tutorials/simpleFoam/pitche
  /constant/polyMesh/blockMeshDict"
Creating blockCorners
Creating curved edges
Creating blocks
Creating patches
Creating block mesh topology
Default patch type set to empty
Check block mesh topology

Basic statistics
Number of internal faces : 18
Number of boundary faces : 42
```

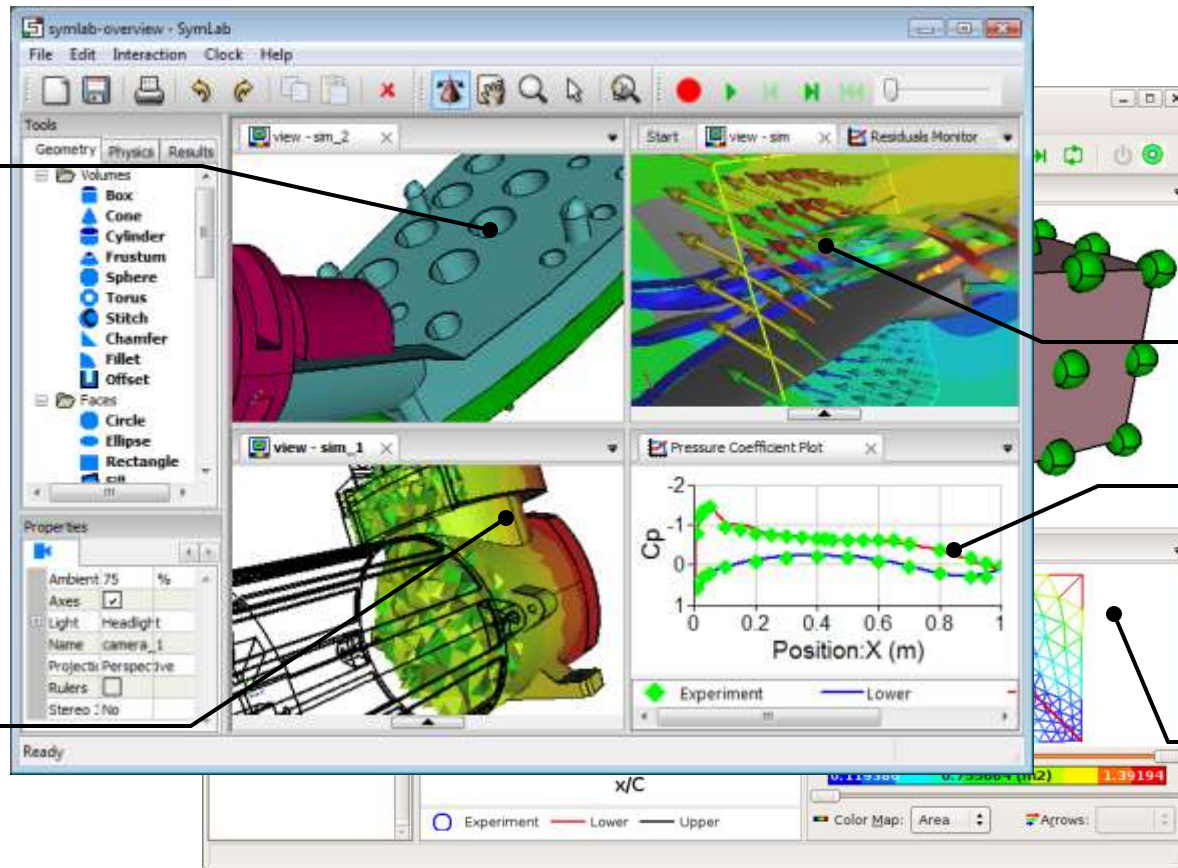


# SymLab

Unified Simulation Environment = Geometry-Physics-Results

B-rep Solid  
Modeler  
(Open-  
Cascade)

Automated  
Meshing +  
Sizing



3D  
Visualization  
(VTK)  
Contours  
Vectors  
Streamlines

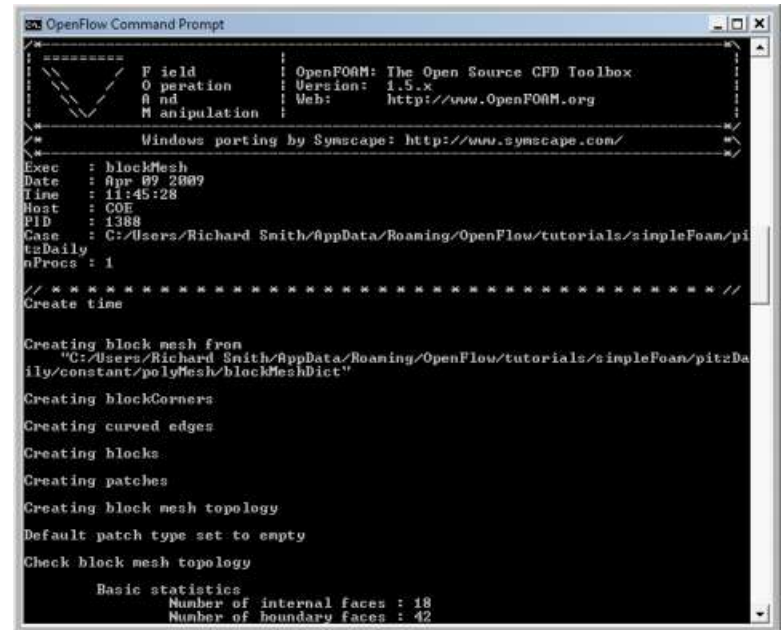
2D Plotting

Cross  
Platform  
(wxWidgets)



# OpenFOAM

- Basic RANS Fluid Flow and Heat Transfer Solvers
- Import/Export Utilities
- Native Windows binaries



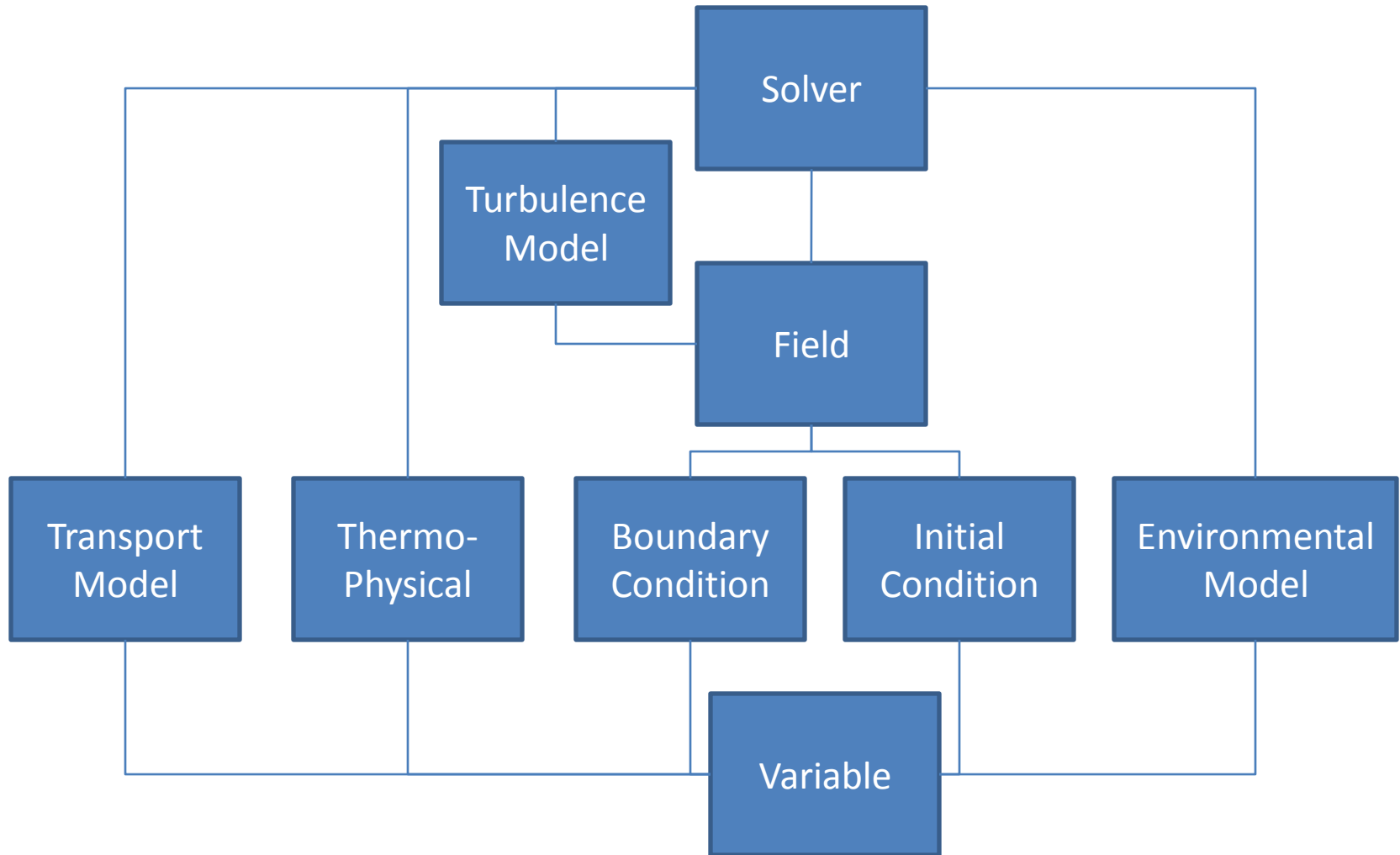
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# OpenFOAM Solver



# SymLab RANS Flow

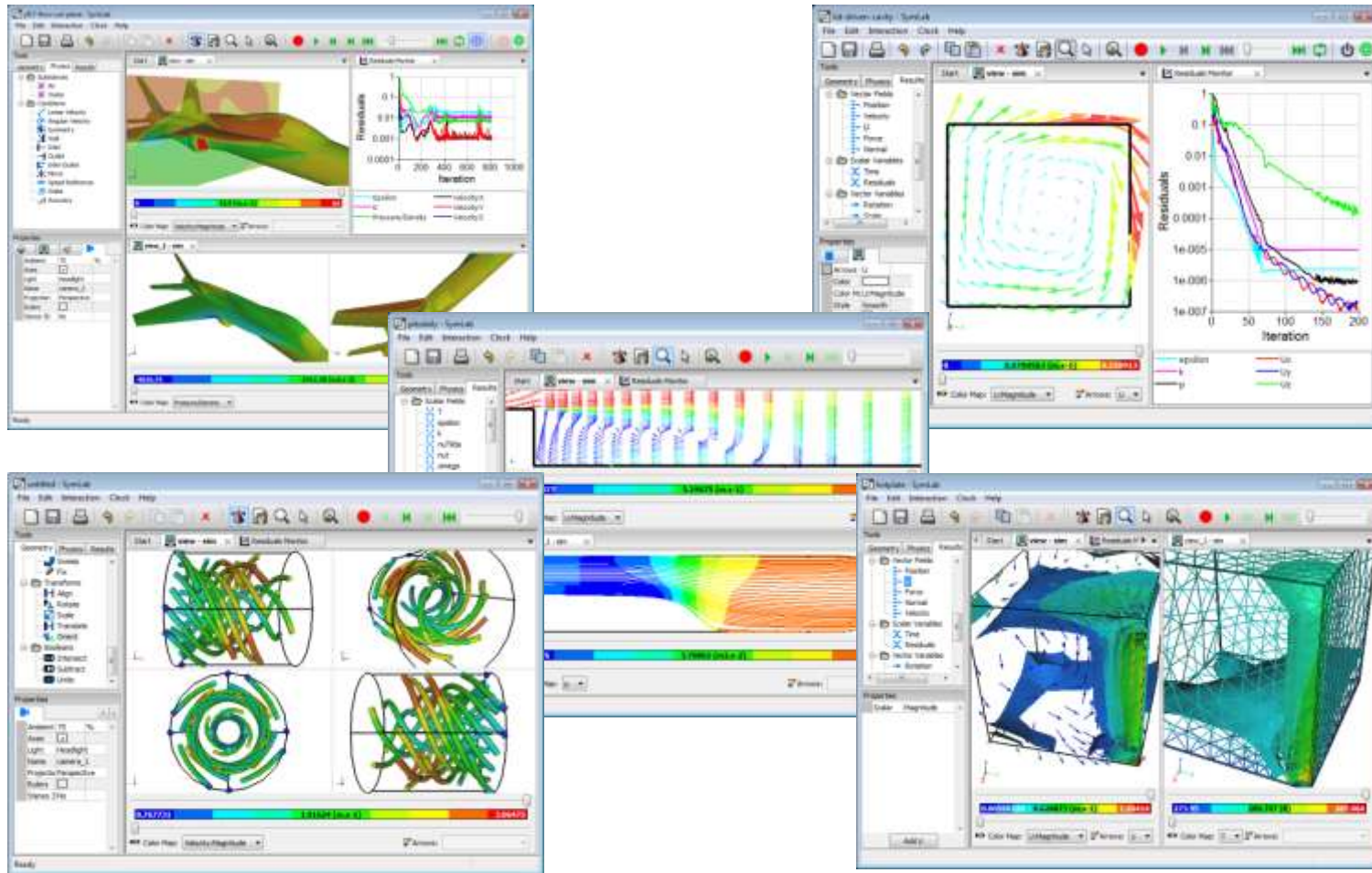
The screenshot shows the SymLab RANS Flow software interface. The main window displays a 3D visualization of a flow field around a propeller-like structure, with streamlines and velocity vectors. The interface includes a menu bar (File, Edit, Interaction, Clock, Help), a toolbar with various icons, and several panels:

- Tools Panel:** Contains sub-sections for Geometry, Physics, and Results. Under Physics, there are checkboxes for Air, Water, Linear Velocity, Angular Velocity, Symmetry, Wall, Inlet, Outlet, Inlet-Outlet, Mirror, Speed Reference, Wake, and Accuracy.
- Properties Panel:** Shows the selected condition's properties. The selected condition is 'Inlet-Outlet' with a 'Free Stream' type. Other properties include Epsilon Turbulence Len, K Turbulence Int, Pres Zero Gradient, and Velo Reference.
- Residuals Monitor Panel:** A graph showing Residuals (log scale from 0.0001 to 1) versus Iteration (0 to 1000). It tracks Epsilon and K residuals.
- 3D Visualization Tools:** A large central area showing the 3D flow field with streamlines and velocity vectors.
- Results Extraction:** A smaller 3D view showing a cross-section of the flow field.
- Interactive Solver Controls:** A set of buttons and a slider at the top right for controlling the simulation.

Annotations with arrows point to the following features:

- Drag'n'Drop Conditions:** Points to the 'Linear Velocity' option in the Tools panel.
- Condition Properties:** Points to the 'Properties' panel.
- Results Extraction:** Points to the smaller 3D view of the flow field.
- Residuals Monitor:** Points to the Residuals vs. Iteration graph.
- 3D Visualization Tools:** Points to the main 3D flow field visualization.
- Interactive Solver Controls:** Points to the simulation control buttons at the top right.

# SymLab RANS Flow Examples



# Summary

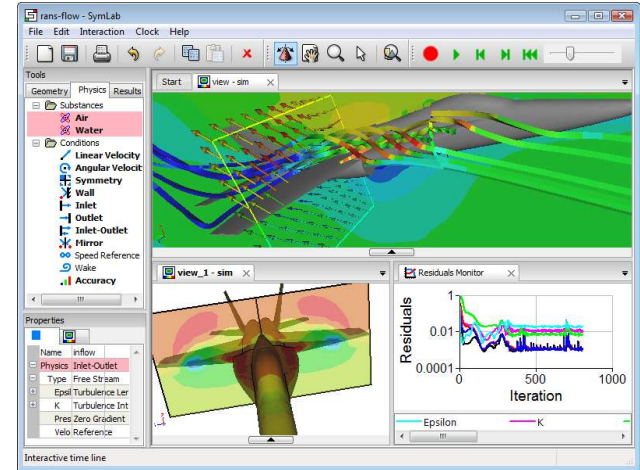
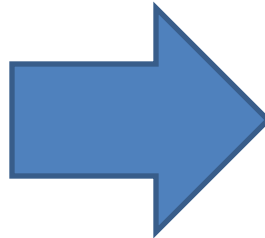
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Questions?

