



Introduction to SU² Code Structure

*SU² Release Version 2.0 Workshop
Stanford University
Tuesday, January 15th, 2013*

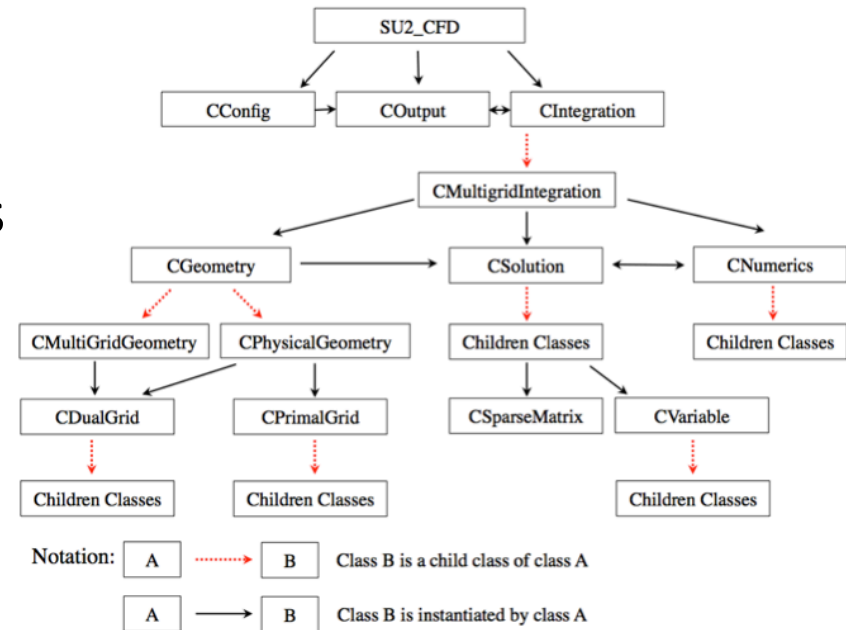
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SU²- Object Oriented Structure

- Why Object Oriented?
 - Easy to add new capabilities
 - Easy to leverage a lot of existing capabilities.





SU² Modules

- **SU2_CFD** – The main PDE solution module
- **SU2_DDC** – The Domain Decomposition Code
- **SU2_MAC** – The Mesh Adaptation Code
- **SU2_MDC** – The Mesh Deformation Code
- **SU2_PBC** – The Periodic Boundary Condition Code
- **SU2_SMC** – The Sliding Mesh Code



SU2_CFD Module

1a) Read Input

Class: **CConfig**

- Read the config file

1b) Read Mesh

Class: **CGeometry**

- Read the mesh file
 - Set up multigrid meshes
- trunk/Common/

2) Solve Equations

Pick Solver

Class: **CSolution**

- Euler Equations: CEulerSolution
- Plasma Equations: CPlasmaSolution
- Adjoint Equations: CEulerAdjSolution
- And others...

3) Write Output

Class: **COutput**

- Print on screen
- Write solution file
- Write restart file
- Write history file

trunk/Common/

Store Flow Variables

Class: **CVariable**

- Stores variables at every mesh node.
- Declare & store all flow variables
 - CEulerVariable: Density, energy etc.
 - CNSVariable: + Viscosity
 - CAdjVariable: Adjoint variables
 - And others...

Discretization

Class: **CNumerics**

Spatial Discretization

- Convective Flux, Jacobian
 - CNumerics:: Roe/JST/etc.
- Viscous Flux, Jacobian
 - CNumerics:: Avg_Grad/etc.
- Source Terms, Jacobian
 - CNumerics:: PieceWiseConst.

Temporal Discretization

- Explicit Euler/ Runge-Kutta
- Implicit Time Integration

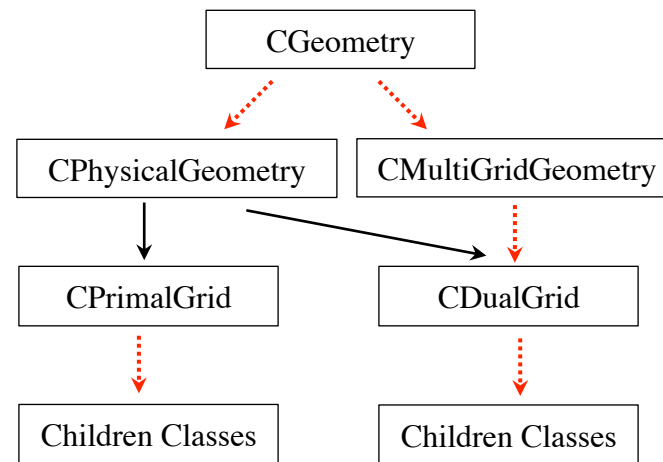
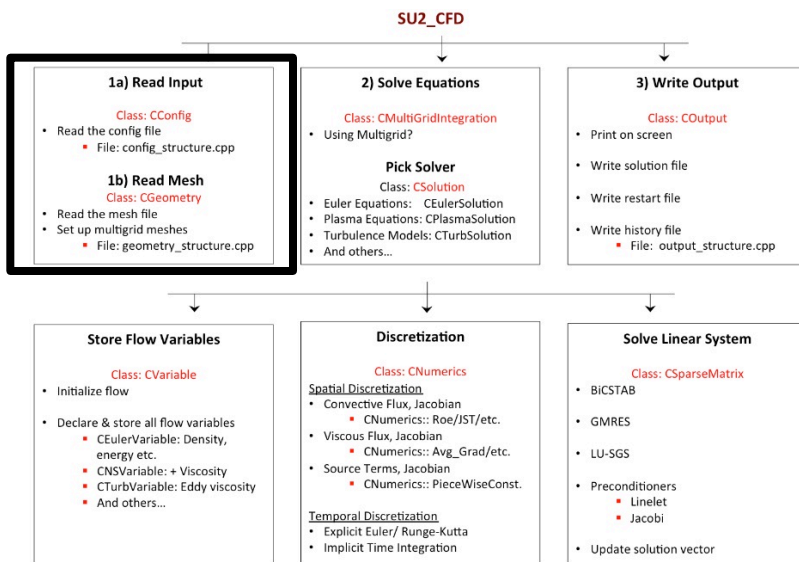
Solve Linear System

Class: **CSparseMatrix**

- BiCSTAB
- GMRES
- LU-SGS
- Preconditioners
 - Linelet
 - Jacobi
- Update solution vector



CGeometry Class

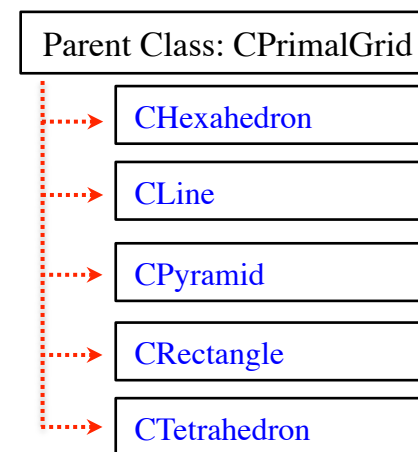
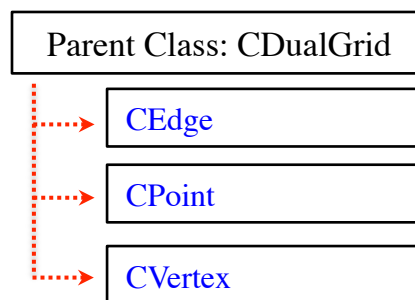


Files in Common/include:

- geometry_structure.hpp
- geometry_structure.inl

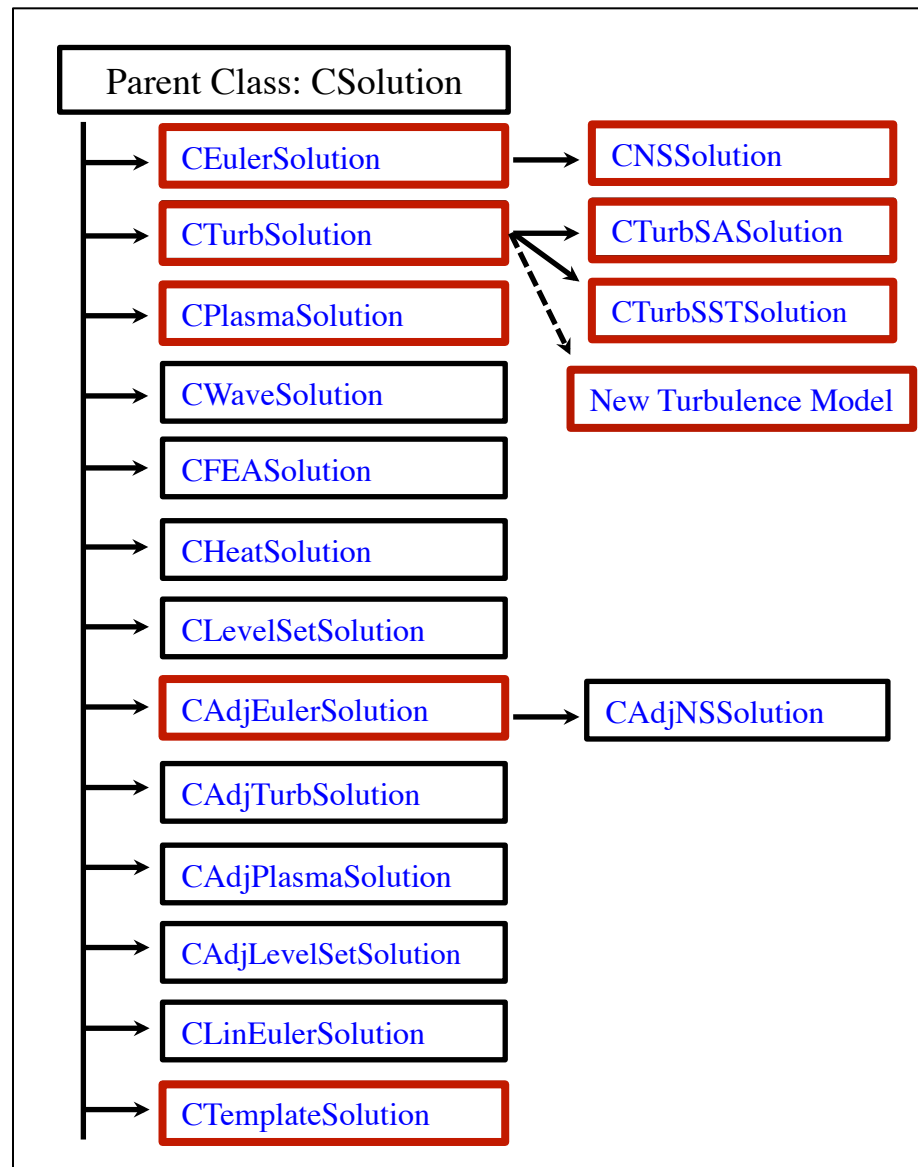
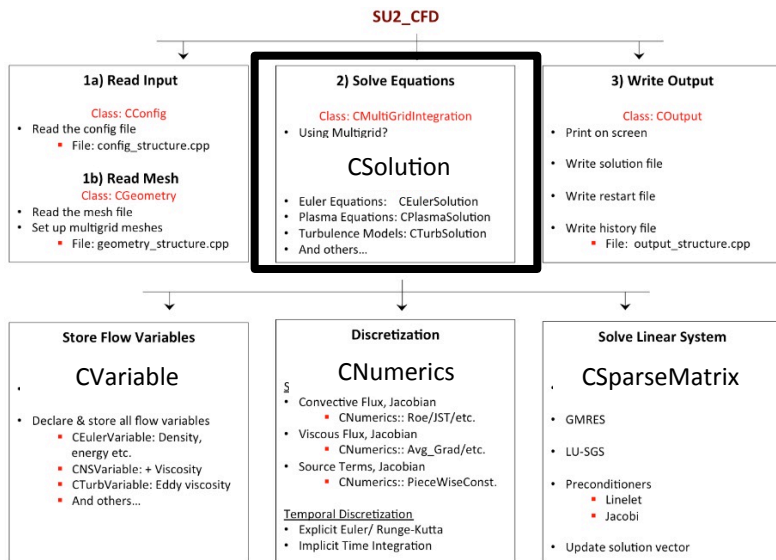
In Common/src

- geometry_structure.cpp





CSolution Class



Files in SU2_CFD/include:

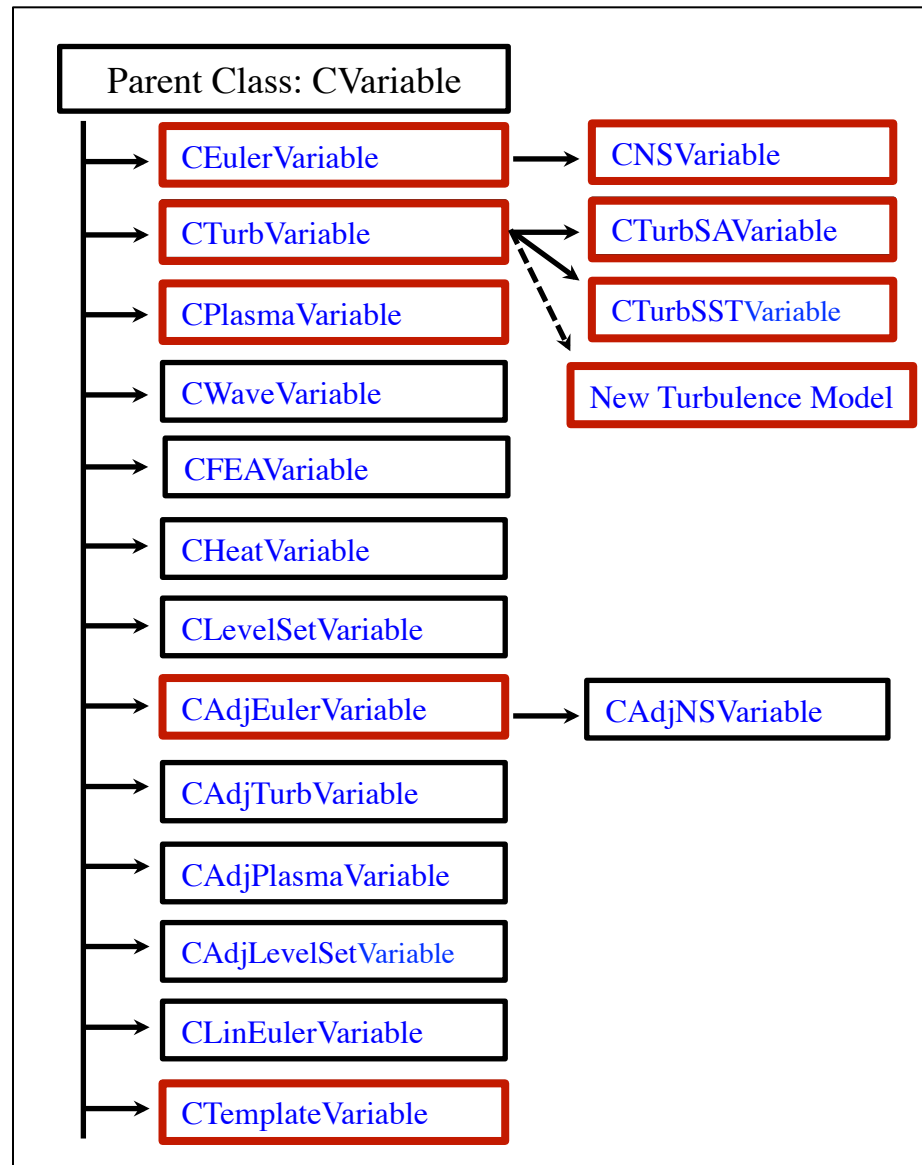
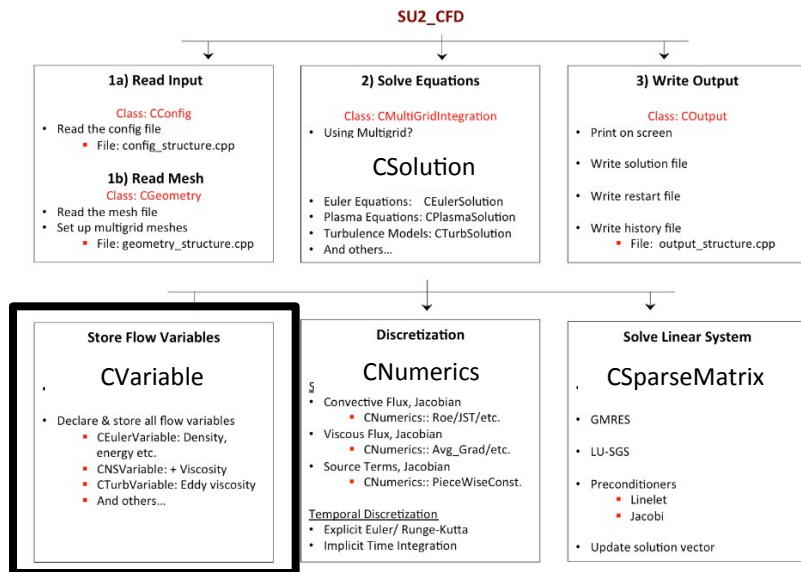
- solution_structure.hpp
- solution_structure.inl

In SU2_CFD/src

- solution_direct_mean.cpp
- solution_adjoint_mean.cpp
- solution_direct_plasma.cpp
- **solution_direct_template.cpp**
- etc.



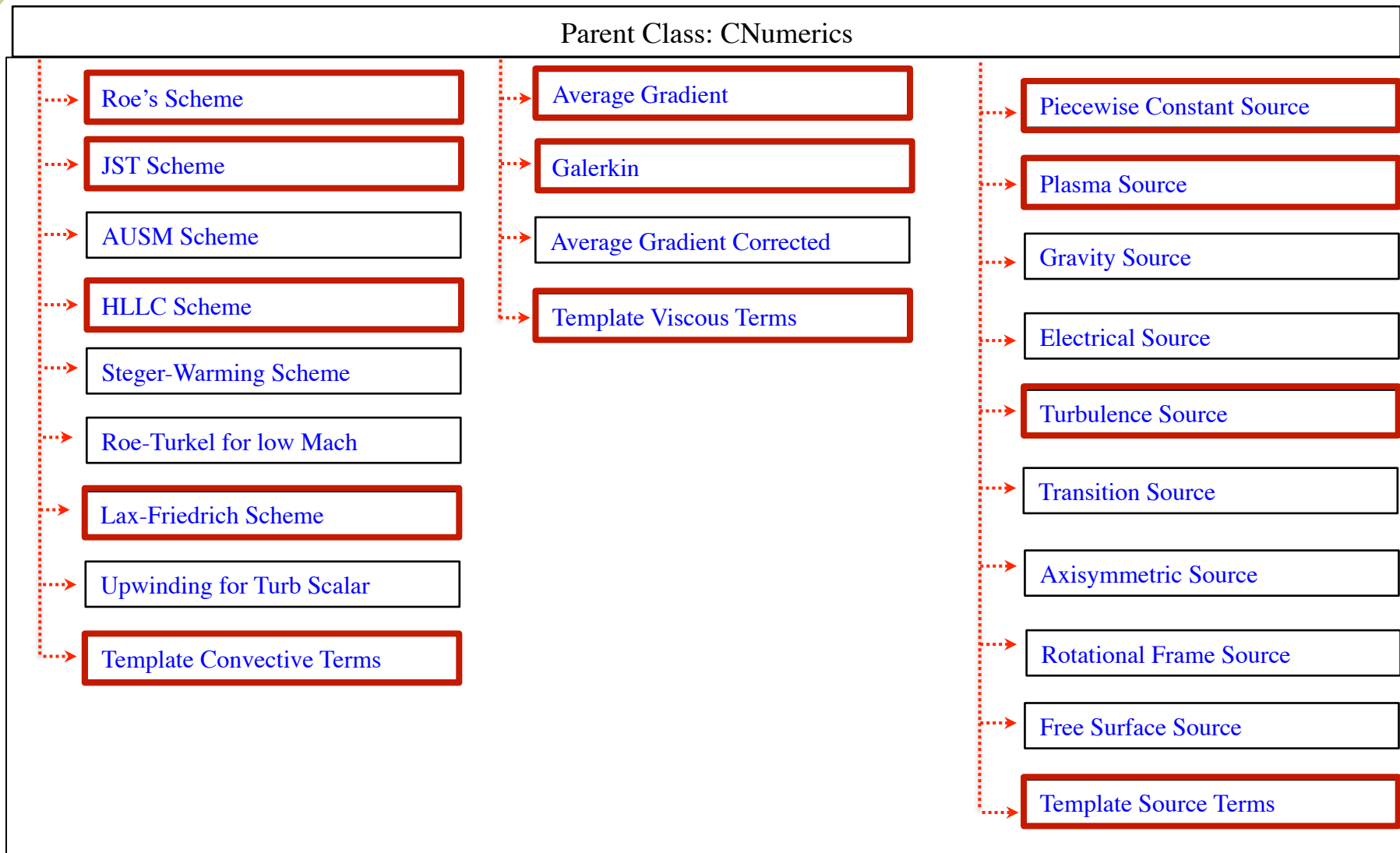
CVariable Class



- Files in SU2_CFD/include
- variable_structure.hpp
 - variable_structure.inl
- SU2_CFD/src
- variable_direct.cpp
 - variable_adjoint.cpp
 - variable_template.cpp
 - etc.



CNumerics Class





More here...



- SU² Paper:
Stanford University Unstructured (SU2): An open-source integrated computational environment for multiphysics simulation and design. [AIAA 2013-0287](#)
- Developers contact:
susquared-dev@mailman.stanford.edu

Thank you