

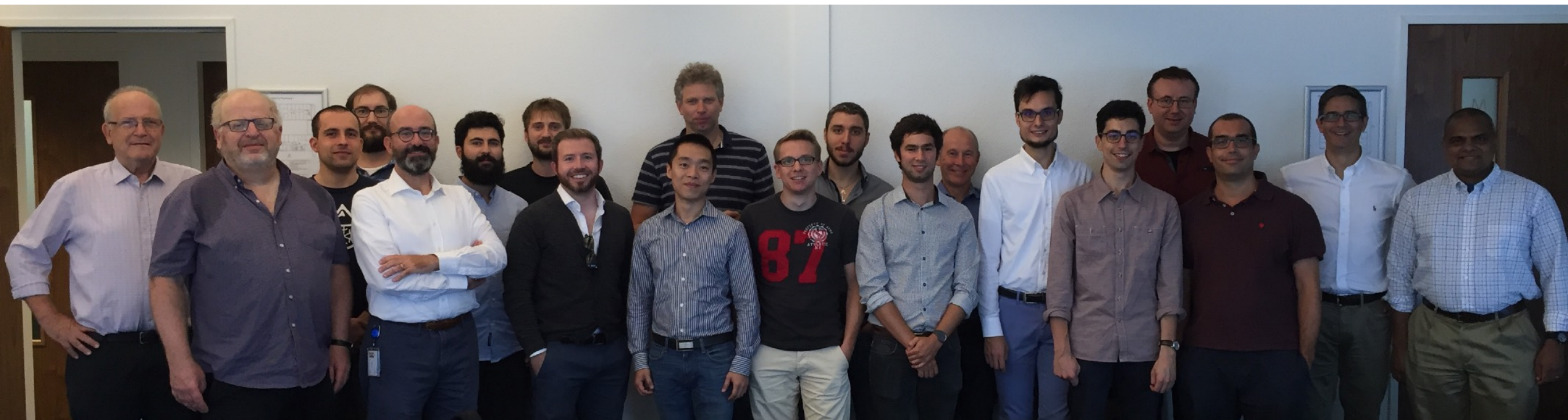


Welcome & Year in Review

Prof. Juan J. Alonso, Dr. Thomas D. Economon, and Dr. Francisco Palacios

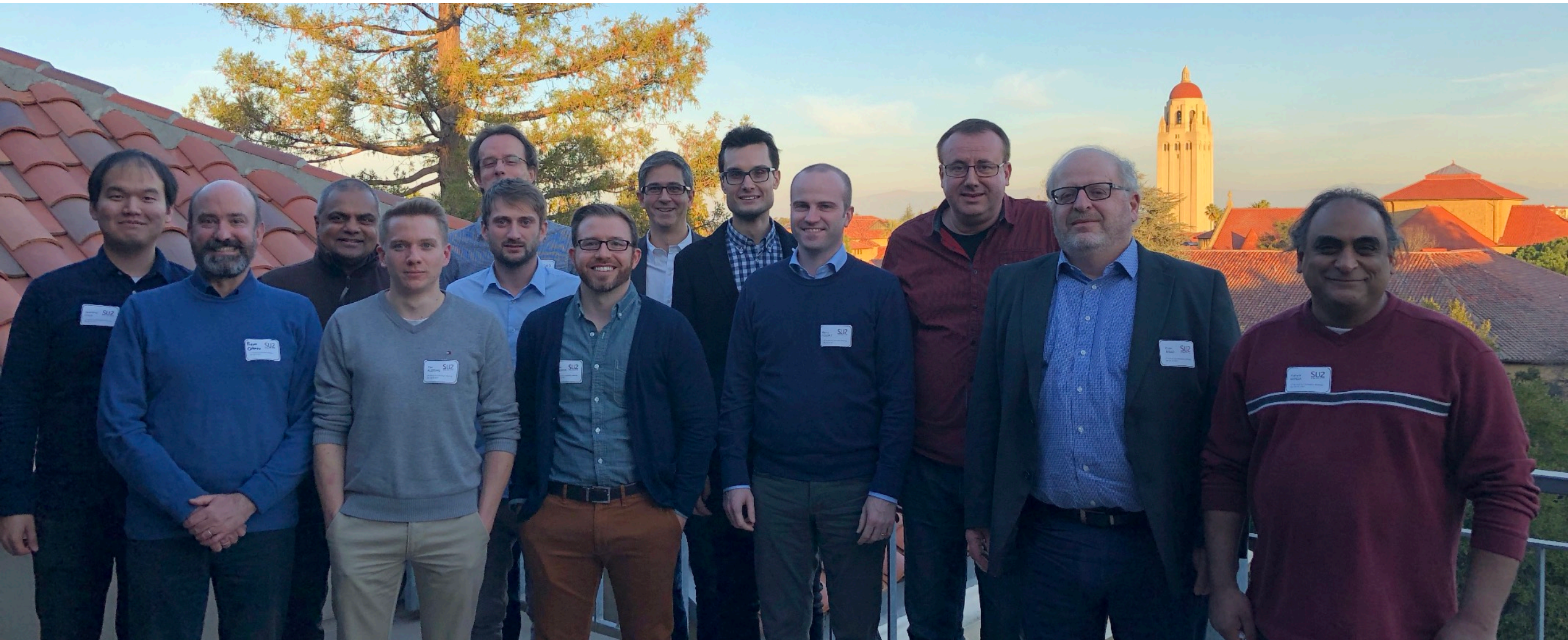
3rd Annual SU2 Developers Meeting
University of Strathclyde
Glasgow, Scotland
September 17, 2018

Welcome Developers!



1st Annual SU2 Developers Meeting, September 2016, TU Delft

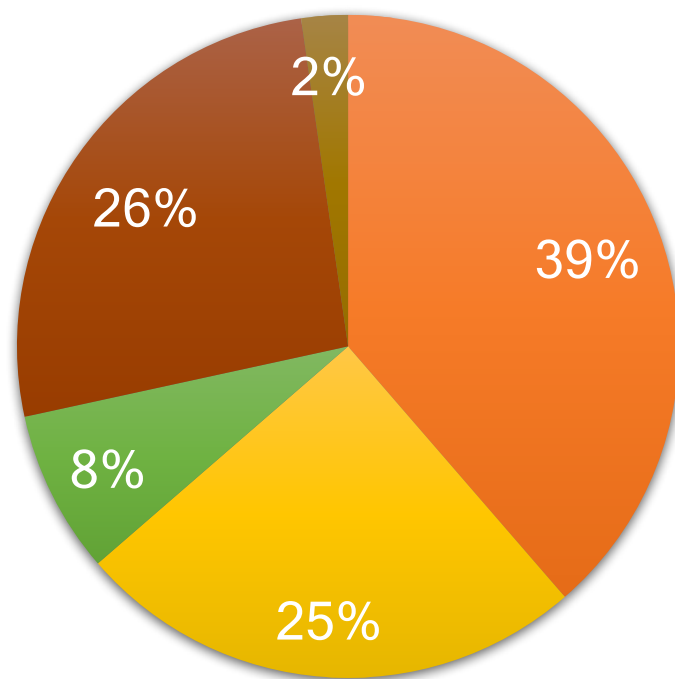
Welcome Developers!



2nd Annual SU2 Developers Meeting, December 2017, Stanford University

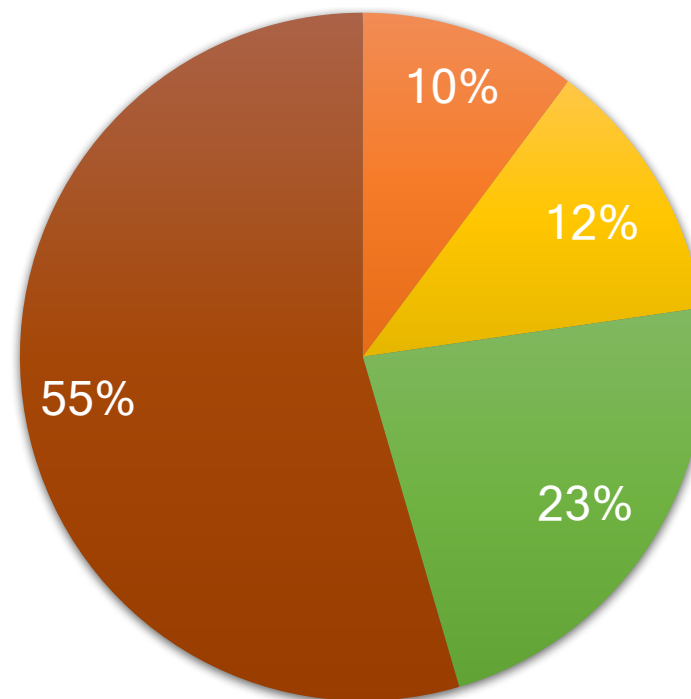
Welcome to the Meeting - Demographics

Affiliation



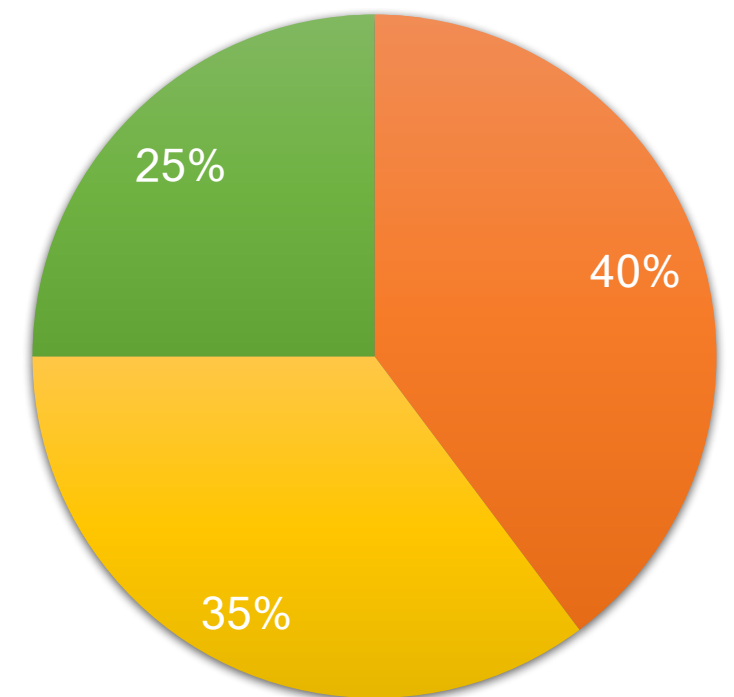
Academia	34	39%
Industry	22	25%
Government	7	8%
Student	23	26%
Other	2	2%

Years of CFD Experience



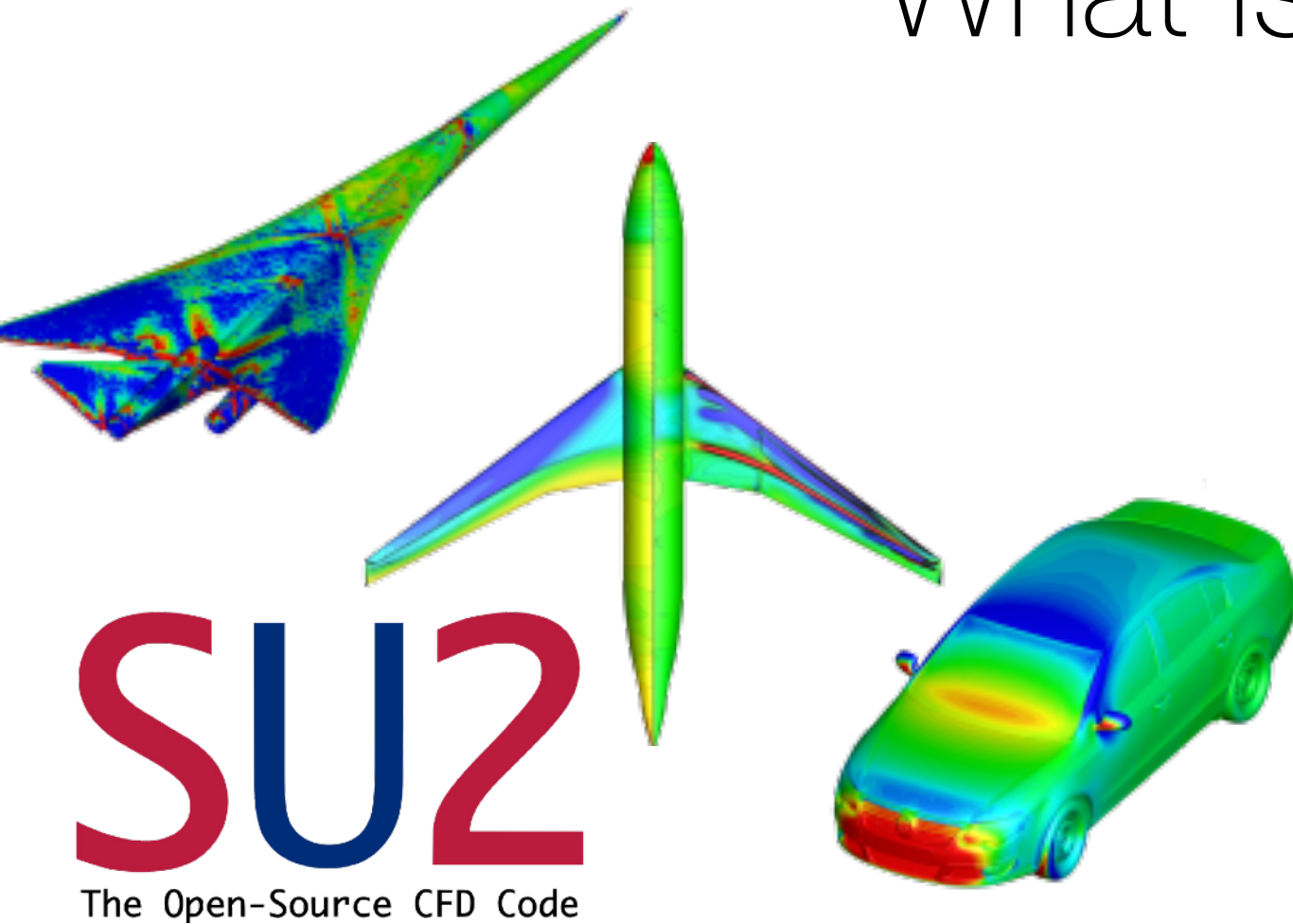
< 1 Year	9	10%
1-2 Years	11	12%
2-5 Years	20	23%
5+ Years	48	55%

SU2 Familiarity

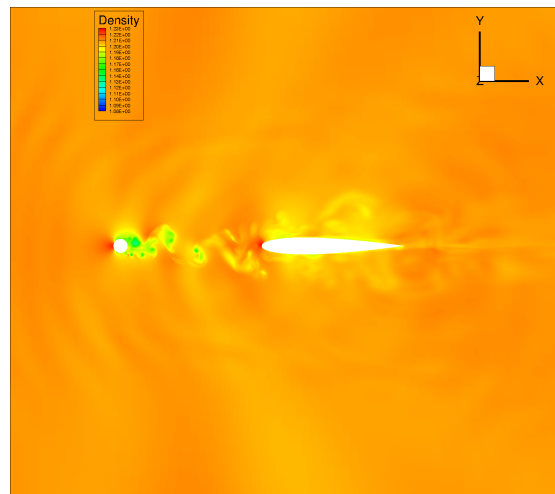


Developer	35	40%
User	31	35%
Have not used SU2	22	25%

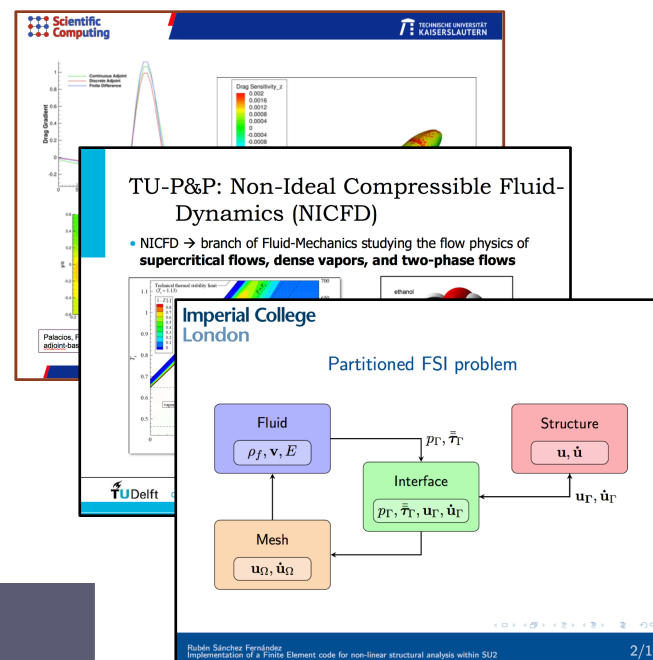
What is SU2?



- SU2 is an open-source software package for **multi-physics analysis and design**. Gradient availability through adjoints.
- Research platform for CFD, multi-physics, adjoint methods, HPC, and more.
Reusability, readability, portability...
- Software released as **open source** under the LGPL 2.1 license. Available **freely** on GitHub.
- C++/MPI core with a Python layer for automation (~250k lines of code, **HPC-ready**).
- Initial v1.0 release in Jan 2012, v.0 released Feb 2018.

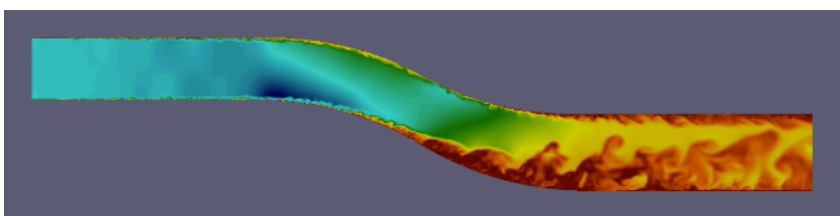


DDES+FWH



<https://github.com/su2code/SU2>

<https://su2code.github.io>



DG-FEM Higher-order Solver

SU2 and the NASA CFD Vision 2030 Study

- **Emphasis on physics-based, predictive modeling**

Transition, turbulence, separation, unsteady/time-accurate, chemically-reacting flows, radiation, heat transfer, acoustics and constitutive models

- **Management of errors and uncertainties**

Quantification of errors and uncertainties arising from physical models, mesh and discretization, and natural variability

- **Automation in all steps of the analysis process**

Geometry creation, meshing, large databases of simulation results, extraction and understanding of the vast amounts of information

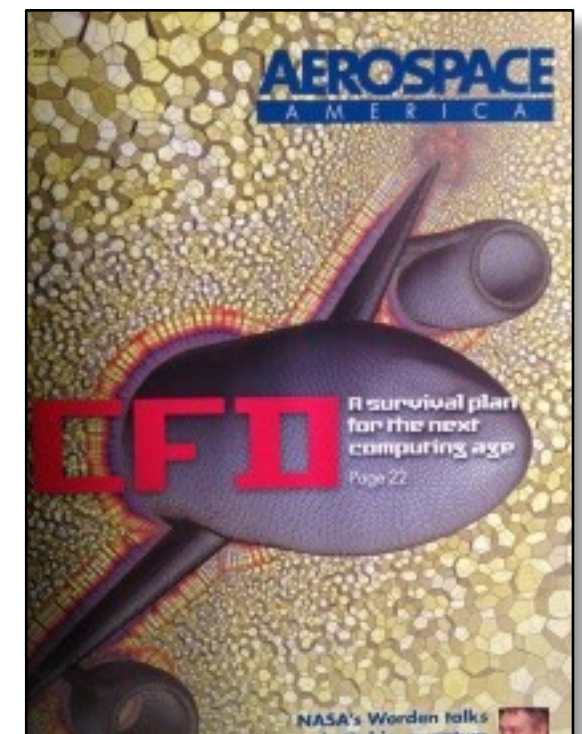
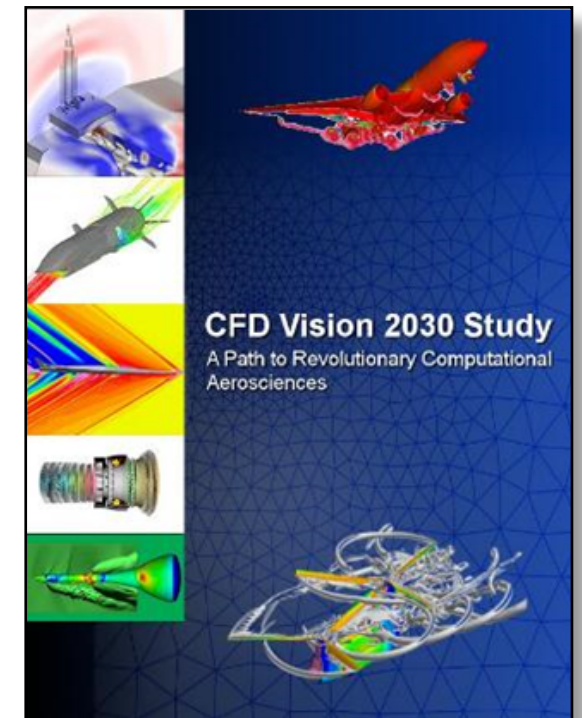
- **Harness exascale HPC architectures**

Multiple memory hierarchies, latencies, bandwidths, programming paradigms and runtime environments, etc.

- **Seamless integration with multi-disciplinary analyses and optimizations**

High fidelity CFD tools, interfaces, coupling approaches, the science of integration, etc.

Slotnik, et al., “CFD Vision 2030 Study: A Path to Revolutionary Computational Aerosciences,” NASA/CR-2014-218178, 2014



SU2 and the NASA CFD Vision 2030 Study

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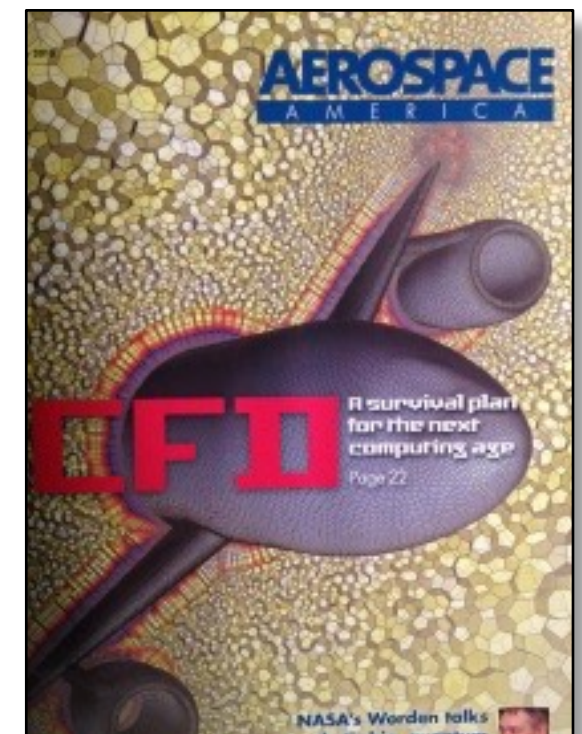
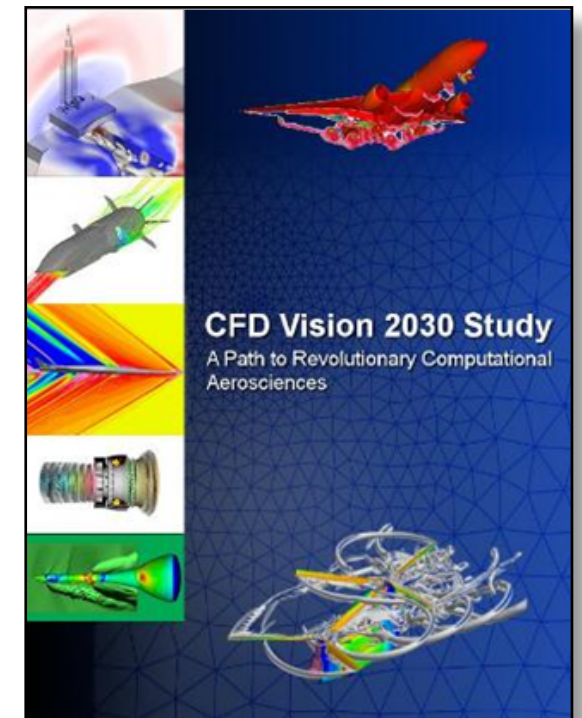
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Slotnik, et al., “CFD Vision 2030 Study: A Path to Revolutionary Computational Aerosciences,” NASA/CR-2014-218178, 2014



A Global Development Team...

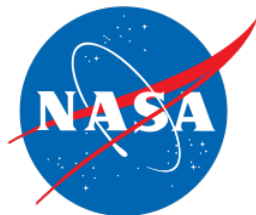
POINTWISE®



UNIVERSITY OF TWENTE.



Imperial College
London



BOSCH

Stanford | ENGINEERING
Aeronautics & Astronautics



POLITECNICO
MILANO 1863



AIRBUS



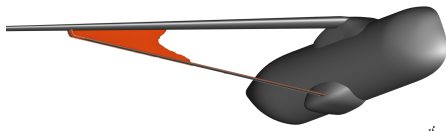
NATIONAL
INSTITUTE OF
AEROSPACE



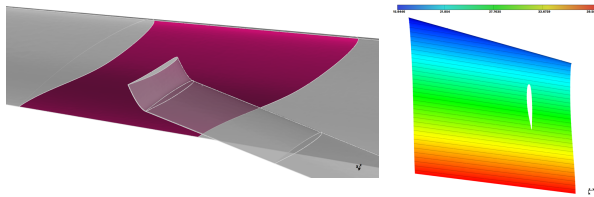
And many others...

Many Exciting News...

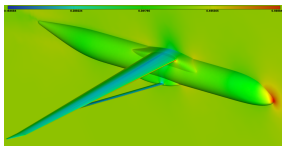
Strut-Braced Wing Design



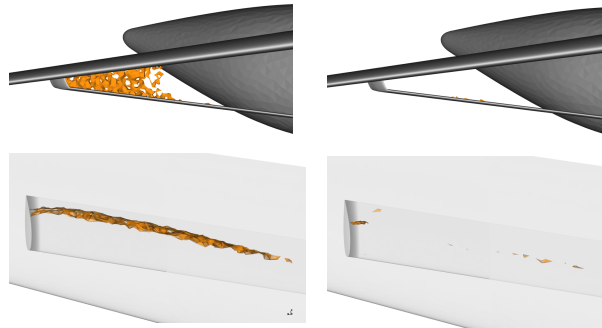
- Strut-Braced Wing aircraft: open model for the community
- Objective: Minimize shock wave drag and separation in strut-wing junction
 - Find candidate flow control technologies and optimization strategies
- Two approaches using SU2:
 - Flow control optimization (transpiration BC)
 - Wing and strut shape optimization



Parametrized transpiration boundary condition used for flow control optimization

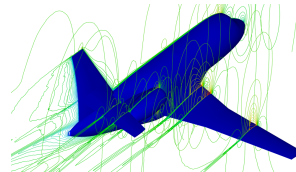


RANS flow field

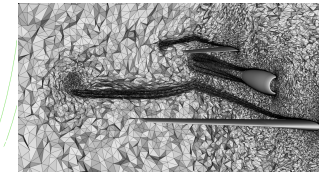


Wave flag : baseline (left) and flow control optimization (right)

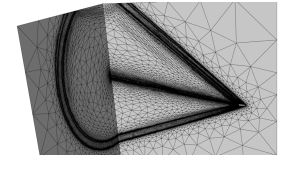
Mesh adaptation with the AMG library



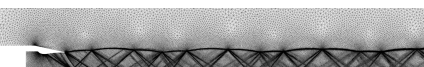
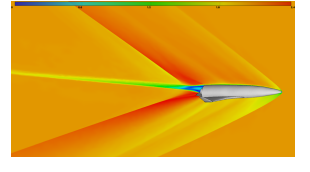
Adapted Dassault Falcon (Euler)



Adapted Dassault Falcon (RANS with adapted boundary layer)



NASA flyer RANS adaptation with frozen boundary layer



2D axisymmetric nozzle adaptation (DARPA)



DARPA EQUIPS – UQ and DUU

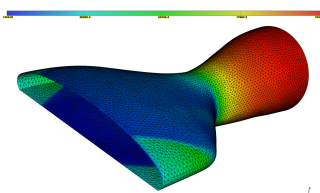
SEQUOIA team: Scalable Environment for Quantification of Uncertainty and Optimization in Industrial Applications

- SU2 :
 - Used in high-level UQ methods for robust and reliability-based design.
 - Complex aero-thermal-structural problems with an external structural/thermal solver AERO-S (FRG).
 - Design Under Uncertainty (DUU): robust and reliability-based design

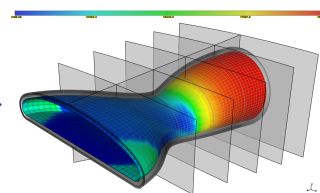
Non-axisymmetric
RANS CFD

Thermal FEM

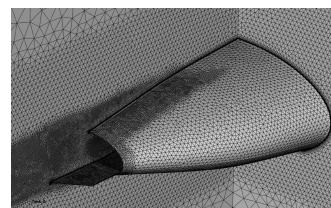
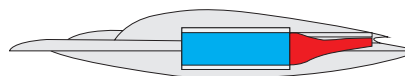
(Non-linear)
Structural FEM



• CFD mesh / pressure



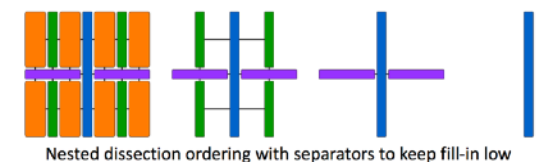
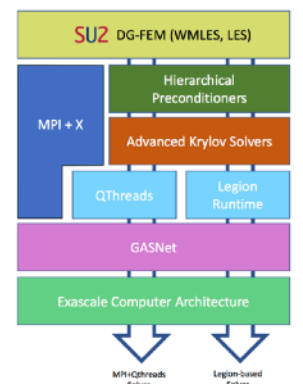
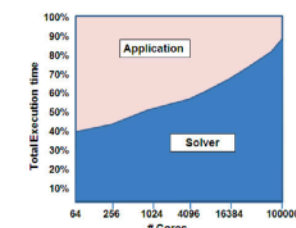
• Interpolated pressure onto the structural / thermal mesh



Scalable hierarchical CFD solvers for future exascale architectures



- Attempting to resolve scalability bottlenecks in large linear system solutions on modern architectures
- Preconditioners based on low-rank compression and hierarchical matrices
- Pipelined s-step communication hiding and communication reducing strategies for iterative Krylov solvers
- Solver prototypes in Qthreads and Legion/Regent
- Demonstrate in SU2 DG-FEM solver



And More News...

- Continued discussions with members of the industry
- Discussions with LLNL for algebraic multigrid solver / preconditioner
- Discussions with NASA for T-Infinity framework participation
- Conversations with NVIDIA for GPU implementations
- Continued efforts with Pointwise and Tecplot (SZL=Sub-Zone Load on Demand)
- Starting collaboration with Ennova
- Final preparations for SU2 Foundation



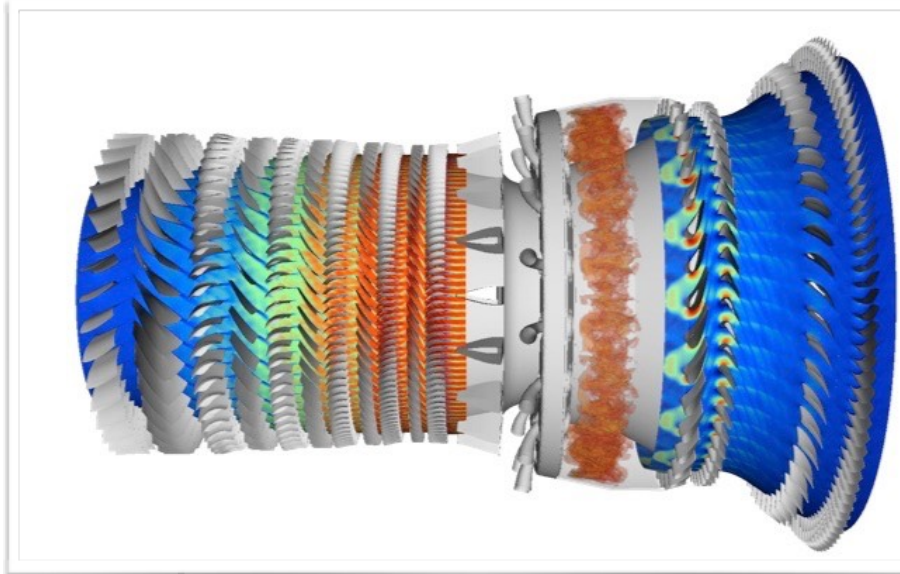
**ENNOVA
TECHNOLOGIES**

tecplot 



POINTWISE®

The SU2 Timeline



SUmb solver
developed
@ ADL

June 2008
Francisco Palacios
completes PhD with
Juan Alonso
on committee



Summer/Fall 2009
Francisco spends
3 months at Stanford



Jan 2011
Francisco joins
ADL @ Stanford



Summer/Fall
Preparations for
releasing SU2 as
open source

2003-2008

2009

2010

2011

“We must think big... on Jan 20th everybody in the aeronautical community must know that there is a new player in the CFD open-source community.”

- Dr. Francisco Palacios, January 9 2012

SU² Pre-Release Workshop

Presented by Thomas D. Economou
Hosted by the SU² Development Team

Aerospace Design Lab, Stanford University, Stanford, CA 94305, U.S.A.

January 17, 2012

STANFORD UNIVERSITY
Unstructured Code

Jan 17
Pre-release
Workshop



aerospacedesignlab

<http://su2.stanford.edu>

STANFORD UNIVERSITY UNSTRUCTURED CODE (SU²) RELEASED
TODAY, THURSDAY JANUARY 19, 2012
The First Release of The SU² Open-Source Computational Fluid Dynamics (CFD)
Analysis and Optimization Suite is Out Today

Jan 19
SU2 v1.0
SU2 is born!

Winter



<http://su2.stanford.edu>

SU² is a cutting-edge, flexible, open-source tool that can be used for:

- High-fidelity analysis
- Adjoint-based design
- Multi-physics simulations
- Adaptive, goal-oriented mesh refinement

Documentation and a full description of current and upcoming features are available on the SU² website:

<http://su2.stanford.edu>

Email the development team: susquared-dev@lists.stanford.edu

About SU²

SU² is an open-source software suite specialized for high-fidelity Partial Differential Equation (PDE) analysis and design of PDE-constrained systems on unstructured grids. The suite includes C++ analysis modules, linked via python scripts, that:

- Solve the PDE system
- Decompose the domain for parallel computations
- Determine sensitivities of an objective function (e.g. lift, drag)
- Deform the model and grid to perform shape optimization
- Perform adaptive grid refinement

Mac OS X, Linux and Windows binary executables can be downloaded from the SU² website: <http://su2.stanford.edu>

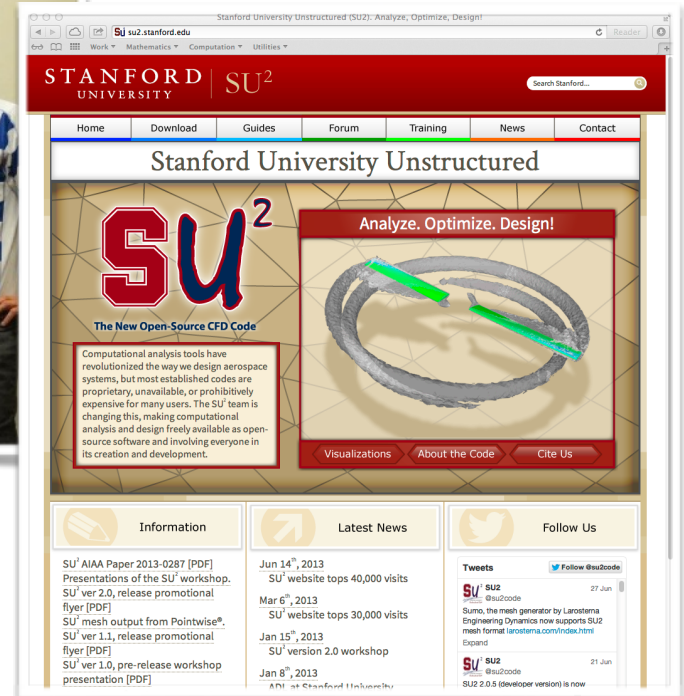
Open-Source Analysis and Design

SU² is under active development by the Aerospace Design Laboratory at Stanford University. Visit the ADL at: <http://adl.stanford.edu>

aerospacedesignlab

Jun 25
SU2 v1.1

Spring



Oct 31
su2.stanford.edu update

SU2 SU2
@su2code

Check out su2.stanford.edu for an open source computational design and analysis tool!

6:59 PM - 25 Sep 2012

Reply to @su2code

Sep 25
First tweet
@su2code

Summer

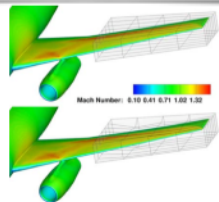
Fall

2012

Stanford University Unstructured (SU²): An open-source integrated computational environment for multi-physics simulation and design.

Francisco Palacios*, Michael R. Colonno*,
Aniket C. Aranake†, Alejandro Campos†, Sean R. Copeland†, Thomas D. Economon†,
Amrita K. Lonkar†, Trent W. Lukaczyk†, Thomas W. R. Taylor†
and Juan J. Alonso†
Stanford University, Stanford, CA 94305, U.S.A.

Jan 7
AIAA SciTech
Presentation




About SU²

SU² is a cutting-edge, flexible, open-source tool that can be used for:

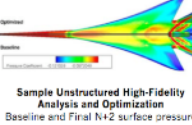
- High-fidelity analysis
- Adjoint-based design
- Multi-physics simulations
- Adaptive, goal-oriented mesh refinement and sliding meshes

Documentation and a full description of current and upcoming features are available on the SU² website:
<http://su2.stanford.edu>

Email the development team:
susquared-dev@lists.stanford.edu



Analyze. Optimize. Design!



Sample Unstructured High-Fidelity Analysis and Optimization
Baseline and Final N+2 surface pressure

STANFORD AERONAUTICS & ASTRONAUTICS

SU² is under active development by the Aerospace Design Laboratory at Stanford University. Visit the ADL at: <http://adl.stanford.edu>

<http://su2.stanford.edu>

Jan 8
SU2 v2.0,
CFD Online
Forum Open

Jan 15
SU2 v2.0
Workshop

SU² Release Version 2.0 Workshop
Tuesday, January 15th, 2013
William F. Durand Building, Rm. 450
496 Lomita Mall
Stanford, CA 94305

SU²
The New Open-Source CFD Code

11.00 – 11.20: Welcome and Introduction to SU² (Dr. Francisco Palacios & Prof. Juan Alonso)

11.20 – 11.30: Quick Overview of SU² Installation (Dr. Mike Colonno & Aniket Aranake)
Please come to the workshop with the software downloaded and installed. If you have any problems, we will provide individual support around the room.

11.30 – 12.00: Introduction to the SU² Code Structure (Amrita Lonkar)
Have a unique application in mind? Learn the structure of the code so you can expand its capabilities to suit your needs!

12.00 – 12.30: Running SU² (Sean Copeland & Tom Taylor)



May 17 & 25
SU2's first two PhDs



OpenMDAO and SU² joint Workshop
Sept 30th – Oct 1st, 2013
William F. Durand Building, Rm. 450
496 Lomita Mall, Stanford, CA 94305

First day - Basic topics

10.00 – 10.15: Welcome and introduction to the Workshop.
10.15 – 10.45: Overview of OpenMDAO and installation.
10.45 – 11.30: Running OpenMDAO and working with Plugins. *Quick start tutorial.*
11.30 – 11.45: Short break.
11.45 – 12.15: Overview of SU² and installation.
11.30 – 13.00: Running SU². *Quick start tutorial.*
13.00 – 13.30: Break (food provided)
13.30 – 14.00: Brainstorming for ideas for possible projects.
14.00 – 16.45: Hack-a-thon. *Work side-by-side writing OpenMDAO/SU² applications.*
16.45 – 17.00: Adjourn first day.

Second day - Advanced topics

9.00 – 9.15: Welcome to the second day.
9.15 – 10.45: Advanced topics in SU²:
• Unsteady RANS simulation. *SU² has multitude of capabilities for performing high-fidelity analysis of complex geometries. Learn about them here.*
• Design and Optimization Using SU². *Learn why SU² is uniquely suited for performing design and optimization of complex aerospace systems.*
10.45 – 11.00: Short break.
11.00 – 12.30: Advanced topics in OpenMDAO:
• Greater modeling flexibility with automatic coupled derivatives in OpenMDAO.
• Building complex MDAO methods (e.g. Efficient Global Optimization, StackMC) with OpenMDAO Drivers, Workflows, and MetaModels.
12.30 – 13.00: Break (food provided)
13.00 – 15.45: Hack-a-thon. *Work side-by-side writing OpenMDAO/SU² applications.*
15.45 – 16.00: Adjourn second day.

Thanks for attending, and note that all stated times are Pacific Time (PDT).
Please RSVP by registering at the SU² home-page (<http://su2.stanford.edu>).

You can find more information about the codes in:
• OpenMDAO home-page: <http://openmdao.org>
• SU² home-page: <http://su2.stanford.edu>

Please, come to the workshop with the software downloaded and installed (<https://github.com/OpenMDAO>, and <https://github.com/su2code>). If you have any problems, we will provide individual support around the room.

Sep 30
OpenMDAO / SU2
Joint Workshop



Aug 10
SU2 on GitHub

Winter

Spring

Summer

Fall

2013



http://su2.stanford.edu

SU²
v3.0 "Eagle"
High performance and industrial-grade shape design for everyone.

SU² EDUCATIONAL v1.0
Educational version of SU², perfect for learning the basics of CFD.

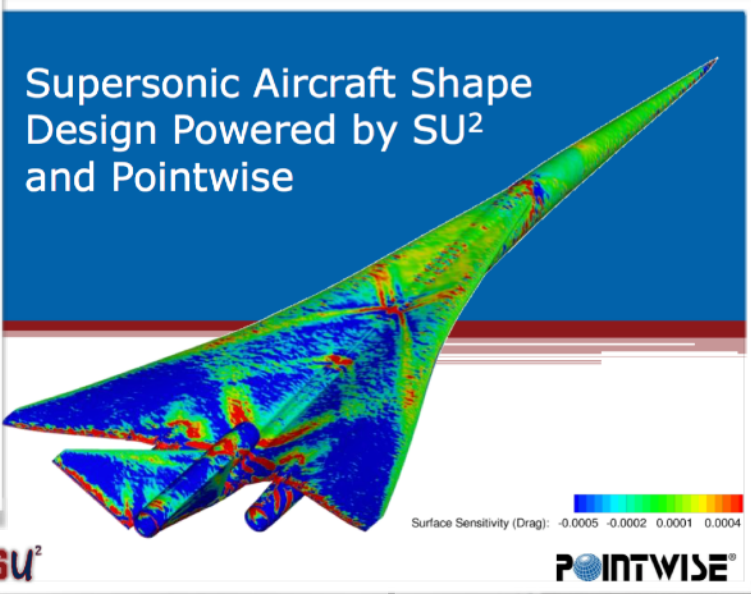
SU²: The Open-Source CFD code

SU² EDU
A new educational version of the Euler/Navier-Stokes/RANS solver from the SU² suite. The simplified structure of this version of SU² makes it well-suited for students and beginners in CFD. SU² EDU is ideal for use in CFD courses, for independent studies, or just to learn about a new field!

High fidelity CFD hypersonic simulation
SOAR shuttle concept - 33 Swiss Space Systems

Stanford Aerospace Design Signat

SU² is under active development by the Aerospace Design Laboratory at Stanford University. Visit the ADL at: <http://adl.stanford.edu>



Supersonic Aircraft Shape Design Powered by SU² and Pointwise

Surface Sensitivity (Drag): -0.0005 -0.0002 0.0001 0.0004

SU² **POINTWISE**




Pointwise® and SU2 Joint Workshop
Sept 29th – Sept 30th, 2014
William F. Durand Building, Rm. 450
496 Lomita Mall, Stanford, CA 94305

First day - Basic topics

- 10.00 – 10.15: Welcome and introduction to the workshop.
- 10.15 – 10.45: Overview of Pointwise® and installation.
- 10.45 – 11.30: Running Pointwise®. Quick start tutorial.
- 11.30 – 11.45: Short break (coffee provided).
- 11.45 – 12.15: Overview of SU2 and installation.
- 12.15 – 13.00: Running SU2. Quick start tutorial.
- 13.00 – 13.30: Break (food provided)
- 13.30 – 15.00: Hybrid meshing using Pointwise®. Learn how to combine the best of both structured and unstructured meshing to generate hybrid meshes for complex geometries.
- 15.00 – 16.30: Optimal Shape Design using SU2. Learn why SU2 is uniquely suited for performing shape design of complex aerospace systems.
- 16.30 – 17.00: Adjourn first day.

Second day - Advanced topics

- 9.00 – 9.15: Welcome to the second day.

Learn how to modify your favorite CFD solver. Learn how to add new options in the configuration file and codebase through GitHub® pull requests. Do you want to implement your own solver in SU2? Put the solver structure from the original developers of SU2. The flexible SU2 capabilities for unsteady problems, including dynamic meshes.

Use Pointwise® for tetrahedral meshing. Clean dirty CAD and learn to generate hybrid meshes. Learn to inspect grid quality and locate problems prior to export. Optimize your meshing tasks using our Glyph scripting language.

Important note: We will host a hands-on session during the workshop to learn more about Pointwise® and SU2.

Time zones are Pacific Time (PDT). Register at <http://su2.stanford.edu>. Please use the following: wise.com

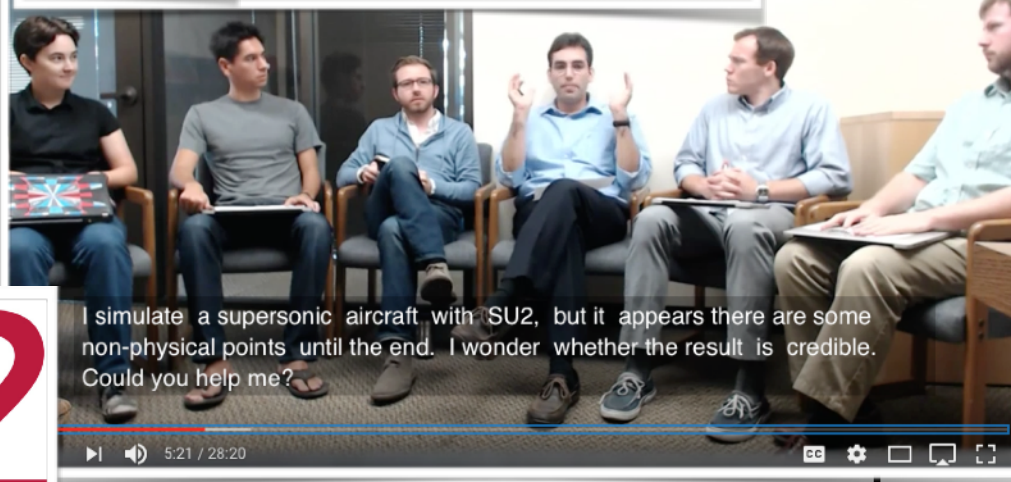
Pointwise (Pointwise, Inc.) will provide a 3-day license during the event. If you have any...

Jan 15
SU2 v3.0
SU2_EDU v1.0

Apr 29
Pointwise-SU2
Webinar




SU2
The Open-Source CFD Code



I simulate a supersonic aircraft with SU2, but it appears there are some non-physical points until the end. I wonder whether the result is credible. Could you help me?

5:21 / 28:20

Jul 29 - New Logo

Jul 31
TU Delft & Polimi
Visit Stanford

intel
May 7
Intel Parallel
Comp. Center

Jun 17
SU2 v3.2

TU Delft
Sep 16
Dev
Email List

Sep 29
Pointwise-SU2
Joint Workshop

Sep 24
"This Week in SU2"
Youtube Season 1
Premiere

Apr 14
SU2 v3.1

Winter

Spring

Summer

Fall

2014



Mar 14
Francisco's farewell
from Stanford



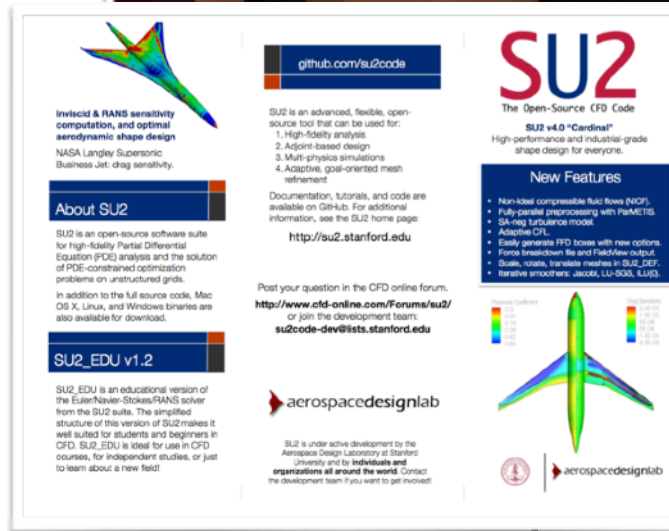
Wednesday, March 18

MS302

PDE-constrained Optimization using the Open-source Code SU2

2:00 PM - 3:40 PM
Room: 151 AB

Most established codes for PDE-constrained optimization are proprietary, unavailable, or prohibitively expensive for many users. The SU2 code is freely available as open-source and features a complete computational analysis framework for multidisciplinary design in applications such as, but not limited to, aerospace technology. This minisymposium will cover up-to-date topics within the SU2 framework related to its continuous and discrete adjoint capabilities, the application to large-scale aerodynamic design, and the utilization of many-core architectures. Each of the topics covered involve the combination of multiple research areas of interest to the CS&E community.



UNIVERSITY OF TWENTE.



Mar 18
SIAM CSE
Mini



March
TU Kaiserslautern
Visits Stanford

Jun 23
SU2 v4.0@ AIAA
AVIATION
Travis Cl

August 6
ALCF Theta
ESP Selection

Aug - Sept
Imperial College
Visits Stanford

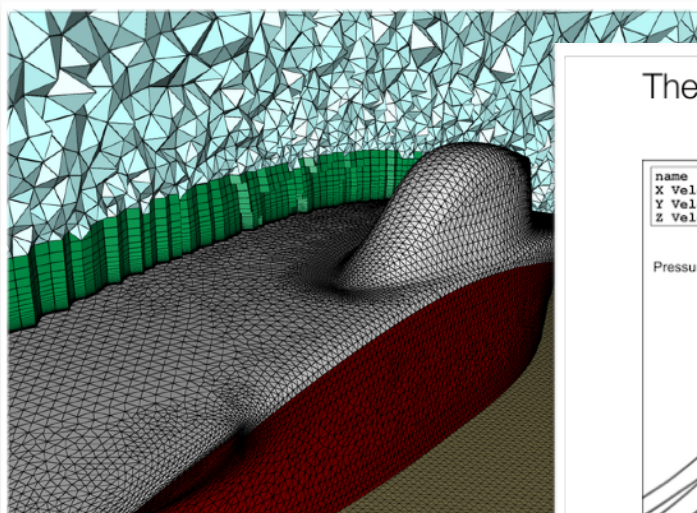
Winter

Spring

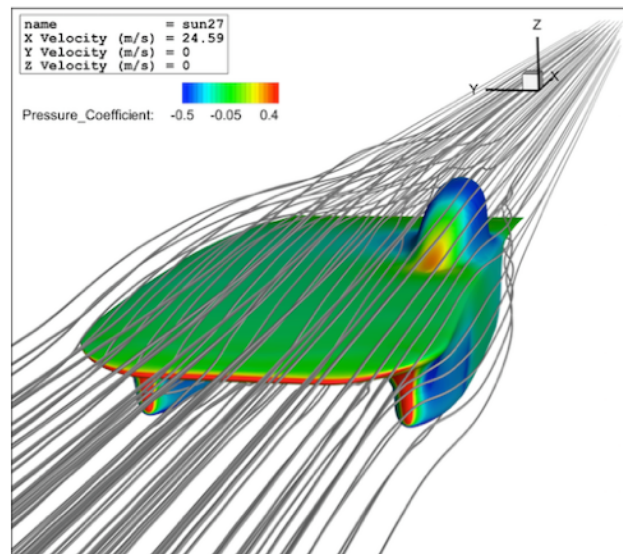
Summer

Fall

2015



The Stanford Solar Car Project's Race for Aerodynamic Efficiency



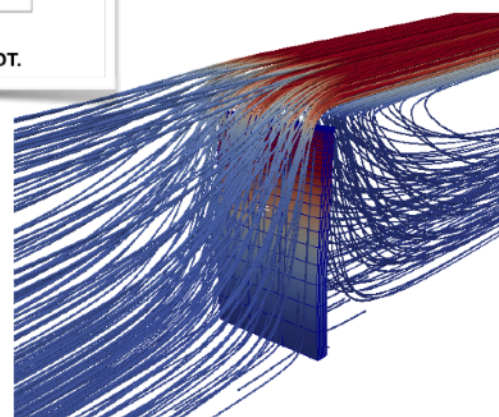
You are invited to a free webinar on Tue, Apr 5, 2016 8:00 AM - 9:00 AM PDT.



SU2

The Open-Source CFD Code

Fluid, meet Structure.



The open-source **SU2** package for CFD analysis and design was conceived as a platform for multi-physics research. We've been hard at work improving our C++ class architecture to more easily support the addition of new physical models and their coupling at a high-level, and today we are releasing a powerful new example in the form of a fluid-structure interaction (FSI) capability embedded within **SU2** version 4.2 "Cardinal."

Download SU2 v4.2

1st Annual SU2 Developers Meeting

Sept 5th, 2016
 TU Delft, AULA Conference Center, Commissie Kamer 3
 Mekelweg 5, 2628 CC Delft, Netherlands

Meeting Agenda

- 09.00 – 09.15: Welcome & Introduction
- 09.15 – 09.35: SU2: Overview of History, Status, and Future Developments
Prof. Juan J. Alonso & Dr. Thomas D. Economon, Stanford University
- 09.35 – 10.00: NICEFD (Non Ideal Compressible Fluid Dynamics) in the SU2 Framework
Prof. Alberto Guardone, Politecnico di Milano (presenter), Profs. Piero Colonna & Matteo Pini, TU Delft
- 10.00 – 10.25: Automatic Differentiation Discrete Adjoint Using SU2
Prof. Nicolas Gauger, TU Kaiserslautern
- 10.25 – 10.35: Coffee Break
- 10.35 – 11.00: Development of a High-Order Discontinuous Galerkin Fluid Solver Within SU2
Prof. Edwin van der Weide, University of Twente
- 11.00 – 11.25: Fluid-Structure Interaction Problems Using Native and External Structural Solvers Coupled to SU2
Prof. Rafael Palacios (presenter) & Mr. Ruben Sánchez, Imperial College, Prof. Vincent Terrapon & Mr. David Thomas, Université de Liège
- 11.25 – 11.50: Turbomachinery Simulations Using SU2
Profs. Matteo Pini (presenter) & Piero Colonna, Mr. Salvatore Vitale, Mr. Antonio Rubino, TU Delft Prof. Alberto Guardone, Mr. Giulio Gori Politecnico di Milano
- 11.50 – 12.15: Mesh Adaptation for SU2 with the INRIA AMG Library
Prof. Juan J. Alonso & Dr. Thomas D. Economon, Stanford University
- 12.15 – 12.45: SU2 Development Priorities for the Next Year / Discussion
Prof. Juan J. Alonso (moderator), all attendees

In order to participate (in-person or virtually), please register for the meeting by following the link on the SU2 home page (<http://su2.stanford.edu>). Thanks for your interest and note that all stated times are Central European Summer Time (CEST).

To find more information about SU2 or to get involved, please visit the following pages:

- SU2 on GitHub: <https://github.com/su2code/SU2>
- SU2 Forum on CFD Online: <http://www.cfd-online.com/Forums/su2/>
- Follow SU2 on Twitter: <https://twitter.com/su2code>

SU2

The Open-Source CFD Code

Continuous *or* and Discrete.

The open-source **SU2** package for CFD analysis and design serves not only as a useable example to computational scientists, but also as a common baseline for future development by the entire community. The current open-source model has enabled the leading experts across many technical areas, anywhere in the world, to work together in creating new capabilities that would not have materialized in the absence of collaboration. Today, we demonstrate this once again with the release of **SU2** version 4.1 "Cardinal."

Download SU2 v4.1

Through collaboration with the SciComp Team at TU Kaiserslautern, we are proud to introduce the support of Algorithmic Differentiation (AD). Based on the C++ interfaces, this enables exact derivative computations throughout the entire implementation uses the recently released open-source library, **CAD**, to compute derivatives of all occurring operations and to evaluate the final gradients. The advanced AD methods (preaccumulation, externally differentiated communication) result in a low memory footprint and fast evaluation.



Jan 7
SU2 v4.1

Feb 29
NASA LBFD
Announced

Apr 5
Pointwise,
Tecplot,
SU Solar Car,
SU2 Webinar

Jun 15
SU2 v4.2

Jul / Aug
U of Liege
Visits Stanford

Universit  de Li ge

Aug
SU2 v4.3

Sep 5
1st Annual SU2
Developers
Meeting

Winter

Spring

Summer

Fall


2016

SU2 Article Becomes Most Read Paper in AIAA Journal

1:49:25

Dec1
Open Technical
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Articles in Advance

AIAA Journal

This Journal is devoted to the advancement of the science and technology of astronautics and aeronautics through the dissemination of original archival research papers disclosing new theoretical developments and/or experimental results. The topics include aerodynamics, aerodynamics, combustion, fundamentals of propulsion, fluid mechanics and reacting flows, fundamental aspects of the aerospace environment, hydrodynamics, lasers and associated phenomena, plasmas, research instrumentation and facilities, structural mechanics and materials, optimization, and thermomechanics and thermochemistry. Papers also are sought which review in an intensive manner the results of recent research developments on any of the topics listed above.

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2010-2016

Volume 54 (2016)

Issue 11, November pp. 3321 - 3328
Issue 10, October pp. 2929 - 3328
Issue 9, September pp. 2561 - 2928
Special Section on Evaluation of R&D

SU2 Winter Workshop
Feb 3rd, 2017
13:00 - 16:00, PST
Stanford, CA 94305

Meeting Agenda

Part I
13:00 - 13:15: Welcome & Introduction
13:15 - 13:35: Tutorial 1: Basic Analysis & Configuration Options
Running SU2 & familiarization with analysis options & capabilities.

MOST READ ARTICLES

SU2: An Open-Source Suite for Multiphysics Simulation and Design
Vol. 54, Iss. 3

Two-equation eddy-viscosity turbulence models for engineering applications
Vol. 32, Iss. 8



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Part I

13.00 - 13.15: Welcome & Introduction

13.15 - 13.35: Tutorial 1: Basic Analysis & Configuration Options
Running SU2 & familiarization with analysis options & capabilities.

13.35 - 13.45: Q&A

13.45 - 14.05: Tutorial 2: Python Scripts & Optimization Problems
Advanced features of SU2, inputs to the SU2 python scripts.

14.05 - 14.15: Q&A

14.15 - 14.30: Coffee Break

Part II

14.30 - 14.45: Code Structure & Locally Modifying the Code
Understanding how SU2 works & how to modify it.

14.45 - 14.50: Q&A

14.50 - 15.00: Introduction to Github and SU2 Development Best Practices
How to share your changes to SU2 with the world.

15.00 - 15.45: Interactive Exercise: Modifying a Python Script
Recommended: bring an idea of a problem that require running several small CFD solutions sequentially or uncertainty quantification.

15.45 - 16.00: Open Discussion

In order to participate (in-person or virtually), please register for the meeting by following the link included in the email. Thank you for your interest in SU2. Please make sure to install SU2 and run at least one tutorial prior to the workshop. (See the [FAQ](#) for more information about SU2 or to get involved, please visit the following pages:

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Stanford | ENGINEERING
AERONAUTICS & ASTRONAUTICS



SU2 v5.0 Raven
Get wrapped up in it.

On January 19, 2012, we launched **SU2** v1.0. What started as a small project has snowballed into a movement. The **SU2** community continues to grow, numbering in the thousands of users and hundreds of developers. Our open-source philosophy let's us bring together the top expertise in CFD from around the world to accomplish new feats at a lightning pace. Today marks the 5th anniversary of SU2, and we're celebrating with the official release of SU2 v5.0.* Raven,* featuring a new in-memory Python wrapper.

[Download SU2 v5.0](#)

Jan 19
SU2 v5.0

Feb 3
SU2 Winter
Workshop
@ Stanford

Summer School on SU2

Lectures and Tutorials on the
Open-Source CFD Code SU2 and the
Adjoint Approach to Design

August 21 – August 25, 2017
Kaiserslautern, Germany

Aug 21
SU2 Summer
School
@ Kaiserslautern

Developers Meeting - View the Agenda
December 18-19, 2017
Stanford University Campus
Register Here!

Latest News

18th, 2017
 18th Annual SU2 Developers
 Meeting hosted at Stanford
 19th, 2017
 Official Release of SU2 v5.0
 5th, 2016
 18th Annual SU2 Developers
 Meeting hosted at TU Delft
 15th, 2016
 Official Release of SU2 v4.2 at
 Aviation
 15th, 2016
 SU2 participates in joint webinar
 with Pointwise, Tecplot, and the
 Stanford Solar Car team

2nd Annual SU2 Developers Meeting
December 18th, 2017
Stanford University, Durand Building, Room 450
Stanford, California, 94305, USA

Meeting Agenda

0800 – 0825: **Welcome & Year in Review**, *J. Alonso, Stanford, T. Economou, Bosch, F. Palacios, Boeing*

0825 – 0850: **Upgrades for Parallel Performance and Low Speed Flows with Heat Transfer**
T. Economou, Bosch

0850 – 0915: **Implementation and Assessment of High-Order Methods in the Framework of SU2**
K. Singh, D. Drikakis, I. Kalkinakis, M. Frank, University of Strathclyde
A BGK-Kinetic Formulation Including Vibrational and Electronic Energy Modes
A. Mogavero, J. Herrero-Montojo, M. Fossati, University of Strathclyde

0915 – 0940: **Current Developments and Applications Related to the Discrete Adjoint Solver in SU2**
T. Albring, N. Gauger, et al., TU Kaiserslautern

0940 – 1005: **Coffee Break**

1005 – 1030: **An Overview of DDES in SU2: Implementation and Recent Results**
E. Molino, R. G. A. da Silva, Aeronautical Institute of Technology (ITA-Brazil)

1030 – 1055: **Recent Advances in Flow Analysis Capability and Adjoint-based Design for Turbomachinery with SU2**
M. Pini, S. Vitale, A. Rubino, I. Azzi, N. Anand, P. Calonna, TU Delft

1055 – 1120: **Uncertainty Estimation of Turbulence Model Predictions in SU2**
J. Mukhopadhyay, A. Mishra, G. Iaccarino, J. Alonso, Stanford

1120 – 1145: **Coffee Break**

1145 – 1210: **SU2: A Reliable Computational Framework for Non-Ideal Compressible-Fluid Dynamics Applications**
G. Gori, Politecnico di Milano, P. M. Congedo, Inria - Bordeaux Sud-Ouest, A. Guardone, Politecnico di Milano

1210 – 1235: **Coupled Adjoint-based Sensibilities Using the SU2 Native FSI Solver**
R. Sánchez, C. Venkatesan-Cramer, R. Palacios, Imperial College

1235 – 1300: **Development of a Nodal DG Solver within the SU2 Framework**
E. van der Weide, University of Twente, J. Choi, Stanford, D. Mudigere, Intel Labs, P. Urbanczyk, J. Alonso, Stanford

In order to participate (in-person or virtually), please register for the meeting by following the link on the SU2 home page (<https://su2code.github.io>). Thanks for your interest and note that all stated times are Pacific Standard Time (PST).

Sep 11
Webpage
Moves
to GitHub

Dec18
2nd Annual
SU2 Dev
Meeting

Winter

Spring

Summer

Fall

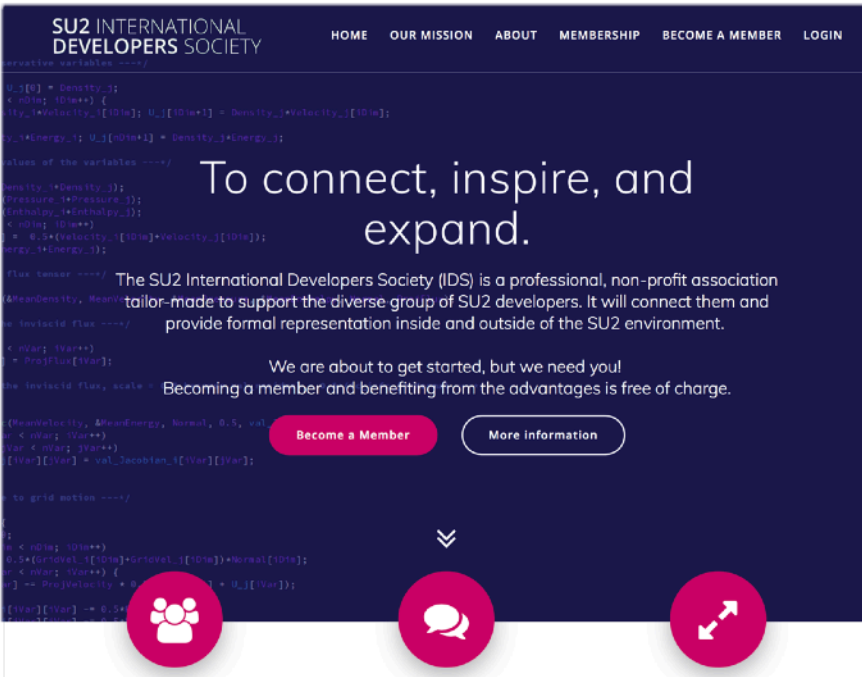
2017



SU2 v6.1.0 Falcon
Powerful. Fast. Free.
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3rd Annual SU2 Developers Meeting
NEW: Download the Meeting Agenda!
Meeting Info Page with Venue and Accommodations
September 16-18, 2018
University of Strathclyde, Glasgow, UK
[Register Here!](#)

<https://su2code.github.io> (left)
<https://www.su2devsociety.org> (below)



SU2 INTERNATIONAL DEVELOPERS SOCIETY
HOME OUR MISSION ABOUT MEMBERSHIP BECOME A MEMBER LOGIN

To connect, inspire, and expand.

The SU2 International Developers Society (IDS) is a professional, non-profit association tailor-made to support the diverse group of SU2 developers. It will connect them and provide formal representation inside and outside of the SU2 environment.

We are about to get started, but we need you!
Becoming a member and benefiting from the advantages is free of charge.

[Become a Member](#) [More Information](#)





SU2
The Open-Source CFD Code

SU2 v6.0 Falcon
Supporting students and professionals since 2012.

Discover **SU2** v6.0 Falcon, the latest release of our open-source software for multiphysics simulation and design. **SU2** v6.0 Falcon is packed with new features and upgrades, making this the best version of **SU2** yet. It's always free, and this version is fierce. If a new release and a new website don't satisfy your appetite for **SU2**, then you should join the new **SU2** International Developers Society, launching today!

[Visit the New SU2 Website](#) [Join the Developers Society](#)

Feb 14
SU2 v6.0
New SU2 Website
SU2 IDS is born!



SU2 v6.1 Falcon
Getting better all the time.

Today, we proudly introduce **SU2** v6.1. This release contains a new feature set for incompressible flows with heat transfer, and we're pairing it with a [new set of tutorials](#) to show you how to use it. Like a fine wine, **SU2** just keeps improving with age, and this vintage is available for you to enjoy today.

[Download SU2 v6.1](#)

June 22
SU2 v6.1.0



3rd Annual SU2 Developers Meeting
September 16th-18th, 2018
University of Strathclyde, Scottish Universities Insight Institute (SUII)
Glasgow, Scotland, UK

Meeting Agenda for Sunday September 16th

0900 – 0915: Welcome & Agenda
0915 – 1045: Introduction to developing in SU2: Covering high level class design, how to modify the code, working with GitHub (branching, PRs, regressions), etc.
1045 – 1615: Hack session: Separate groups working on various problems (lunch and snacks/coffee offered in the room while working)
1615 – 1700: Wrap-up Presentations: Two-side presentations on major progress for the day, including discussion
1730 – open: Social at "The Counting House", 2 St Vincent Place, G1 2DH

Meeting Agenda for Monday September 17th

0800 – 0830: Welcome & Year in review, [T. Economon](#) (Bosch), [J.J. Alonso](#) (Stanford)
0830 – 0900: SU2-NEMO - Thermochemistry and high-Mach aerothermodynamics, [M. Fossati](#) (U. of Strathclyde), [T. Magin](#), [J.B. Scoggins](#), [M. Pini](#), [P. Colonna](#), [R. Sanchez](#), [T. Economon](#), [D. Mayer](#), [N. Beishuizen](#), [C. Garbacz-Gomes](#), [W.T. Meyer](#), [J.J. Alonso](#), [T. van der Stelt](#)
0900 – 0930: Toward optimization for reactive flows in SU2, [N. Beishuizen](#) (Bosch), [D. Mayer](#), [T. Economon](#)
0930 – 1000: Conjugate heat transfer problems and computing coupled discrete adjoints using AD, [D. Burghardt](#) (TU Kaiserslautern), [T. Albring](#), [N. Gauger](#)
1000 – 1030: Coffee break
1030 – 1100: Physics-based RANS model-form UQ in SU2, [J. Mukhopadhyaya](#) (Stanford), [A. Mahra](#), [J.J. Alonso](#), [G. Iaccarino](#)
1100 – 1130: Aeroacoustics prediction and optimization capabilities in SU2, [B. Zhou](#) (NIA/NASA-Langley), [T. Albring](#), [N. Gauger](#), [C. Ilario](#), [T. Economon](#), [J.J. Alonso](#), [L.V. Lopes](#), [H. Yao](#), [S. Peng](#), [L. Davidson](#)
1130 – 1200: Higher-order SU2: DG-FEM solver and WENO-FV solver with LES/ILES/WMLES applications, [E. van der Weide](#) (U. of Twente), [J.J. Alonso](#), [D. Drikakis](#), [K. Singh](#), [P. Urbaniczak](#), [E. Molina](#), [J.H. Choi](#)
1200 – 1300: Lunch
1300 – 1330: Unsteady optimization with SU2: application to turbomachinery design, [A. Rubino](#) (TU Delft), [M. Pini](#), [N. Anand](#), [P. Colonna](#)
1330 – 1400: Preliminary results on rotor-fuselage aerodynamics using SU2: status and challenges, [M. Morelli](#) (Politecnico di Milano), [G. Gori](#), [A. Guardone](#)
1400 – 1430: Anisotropic mesh adaptation with the INRIA AMG library, [A. Losville](#) (INRIA), [V. Menier](#), [B. Munguia](#), [J.J. Alonso](#)
1430 – 1500: Coffee break
1500 – 1530: Simulation and adjoint-based design for variable density incompressible flows with heat transfer, [T. Economon](#) (Bosch)
1530 – 1600: Implementation of pressure-based Navier-Stokes for wind energy applications, [A. Ravishankara](#) (ECN part of TNO), [H. Ozdemir](#), [E. van der Weide](#)
1600 – 1630: SU2-IDS: International Developers Society, [T. Albring](#), [B. Sanchez](#) (TU Kaiserslautern), [T. Economon](#), [F. Palacios](#)
1630 – 1700: Wrap up, [J.J. Alonso](#) (Stanford)

In order to participate (in-person or virtually), please register for the meeting by following the link on the SU2 home page (<https://su2code.github.io>).
*Please note that all stated times are British Summer Time (BST). **The presenter author is underlined

Stanford

Sep 17
3rd Annual
SU2 Dev Meeting

Winter

Spring

Summer

Fall

2018

SU2 v6.1.0 Falcon

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3rd Annual SU2 Developers Meeting

NEW: Download the Meeting Agenda!

Meeting Info Page with Venue and Accommodations

September 16-18, 2018

University of Strathclyde, Glasgow, UK

Register Here!

Major upgrade for <https://su2code.github.io>


```
servative variables ---*/
```

```
U_j[0] = Density_j;  
< nDim; iDim++) {  
sity_i*Velocity_i[iDim]; U_j[iDim+1] = Density_j*Velocity_j[iDim];
```

```
ty_i*Energy_i; U_j[nDim+1] = Density_j*Energy_j;
```

```
values of the variables ---*/
```

```
Density_i+Density_j);  
(Pressure_i+Pressure_j);  
(Enthalpy_i+Enthalpy_j);  
< nDim; iDim++)  
] = 0.5*(Velocity_i[iDim]+Velocity_j[iDim]);  
nergy_i+Energy_j);
```

```
flux tensor ---*/
```

```
(&MeanDensity, MeanVelocity, &MeanEnergy, Normal, ProjFlux)
```

```
the inviscid flux ---*/
```

```
< nVar; iVar++)  
] = ProjFlux[iVar];
```

```
the inviscid flux, scale = 0.5*(val_Jacobian_i[iVar]*val_Jacobian_j[iVar]);
```

```
ac(MeanVelocity, &MeanEnergy, Normal, 0.5, val_  
ar < nVar; iVar++)  
jVar < nVar; jVar++)  
j[iVar][jVar] = val_Jacobian_i[iVar][jVar];
```

```
to grid motion ---*/
```

```
{  
0;  
im < nDim; iDim++)  
0.5*(GridVel_i[iDim]+GridVel_j[iDim])*Normal[iDim];  
ar < nVar; iVar++) {  
ar] -= ProjVelocity * 0.5*(val_Jacobian_i[iVar][iVar] + U_j[iVar]);
```

```
i[iVar][iVar] -= 0.5*(  
i[iVar][iVar] -= 0.5*(
```

To connect, inspire, and expand.

The SU2 International Developers Society (IDS) is a professional, non-profit association tailor-made to support the diverse group of SU2 developers. It will connect them and provide formal representation inside and outside of the SU2 environment.

We are about to get started, but we need you!

Becoming a member and benefiting from the advantages is free of charge.

[Become a Member](#)

[More information](#)

New web portal: <https://www.su2devsociety.org>



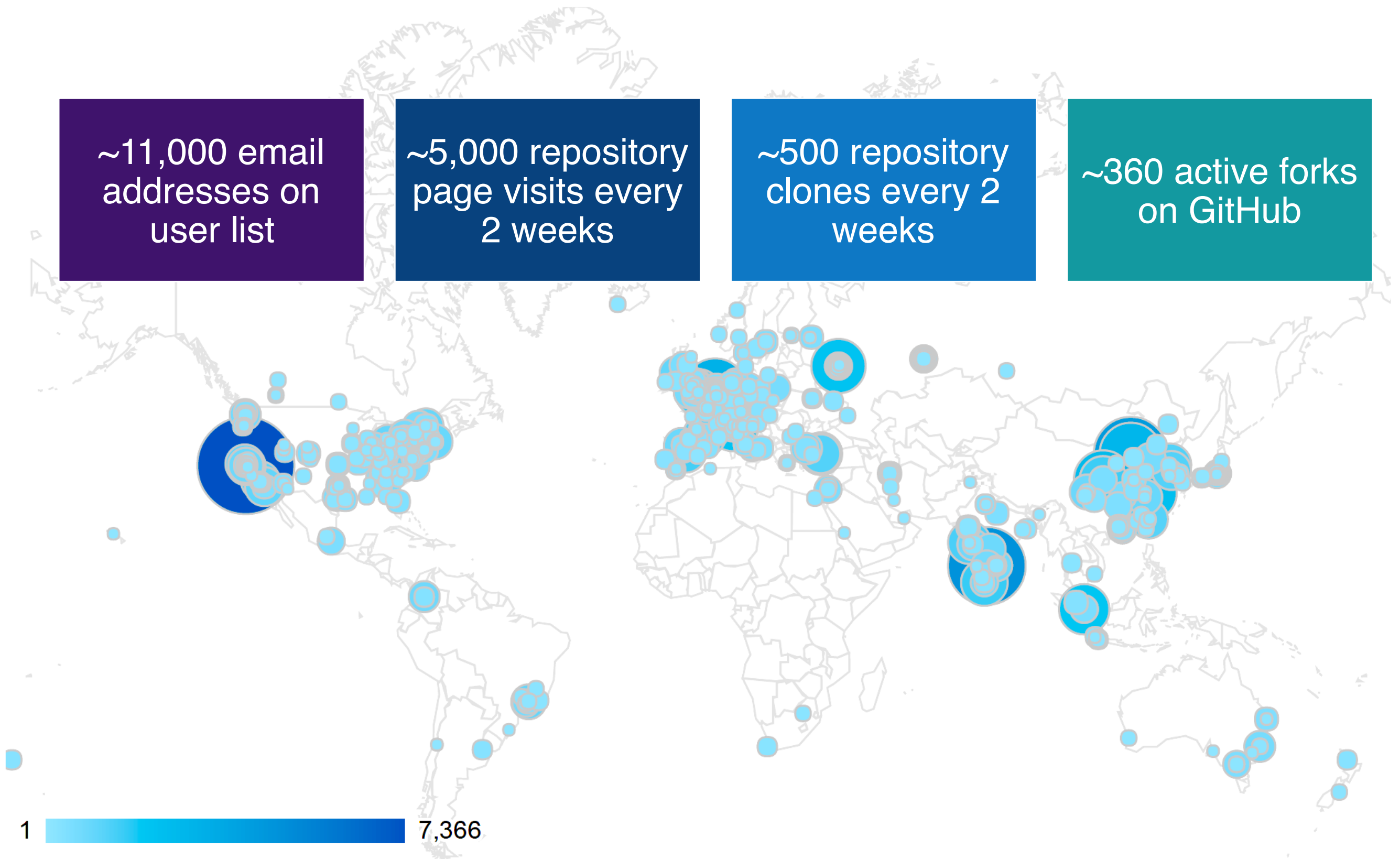
Where are we today? Everywhere.

~11,000 email
addresses on
user list

~5,000 repository
page visits every
2 weeks

~500 repository
clones every 2
weeks

~360 active forks
on GitHub



Map shows web hits at <https://su2code.github.io> by city.

51 Pull
Requests in
2018

455 Commits
to 'develop'
Branch in 2018

228k Lines of
C/C++ Code
as of v6.1.0

209 Continuous
Regression
Tests

154 Active
Branches in
Repository

362 Active
Forks on
GitHub



Anyone can be an SU2 Developer.

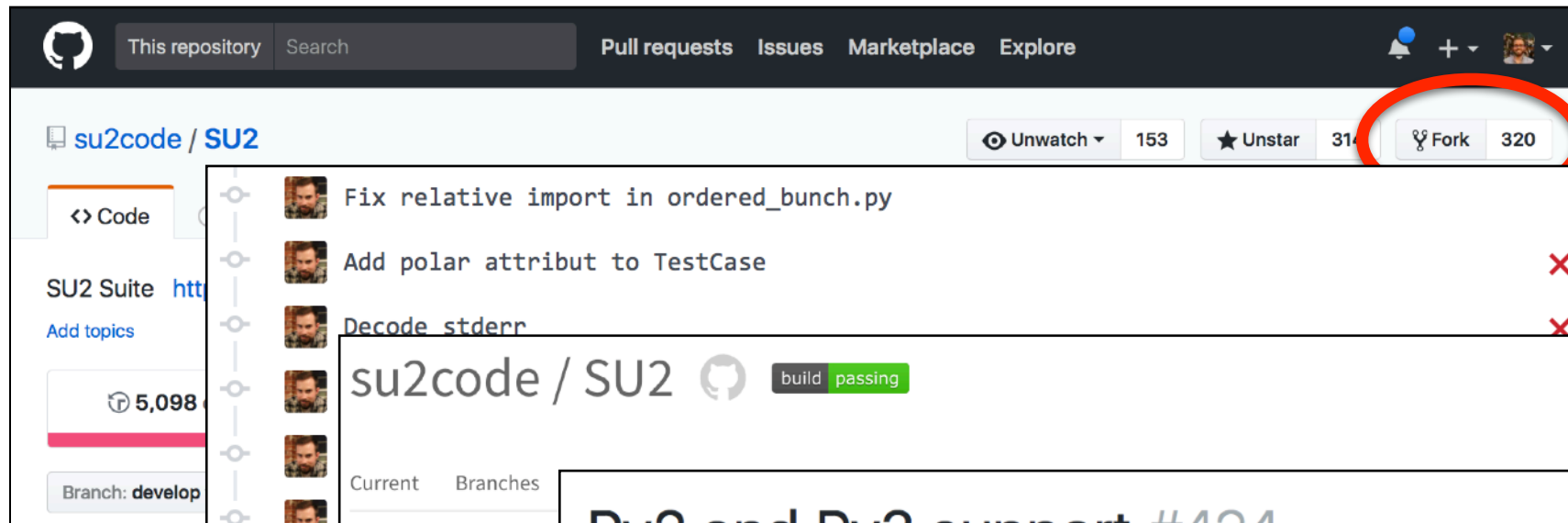
Git/Branching

Development

Regressions

Pull Request

Release



Want to learn how to get started? Check out the developer tutorial slides from the 2018 SU2 Hackathon!

su2code / SU2

Py2 and Py3 support #424

Merged economon merged 89 commits into su2code:develop from petebachant:py2_and_py3_support 8 days ago

talbring approved these changes 12 days ago

Just tested the branch locally. Everything seems to work fine. We can merge this is in next.

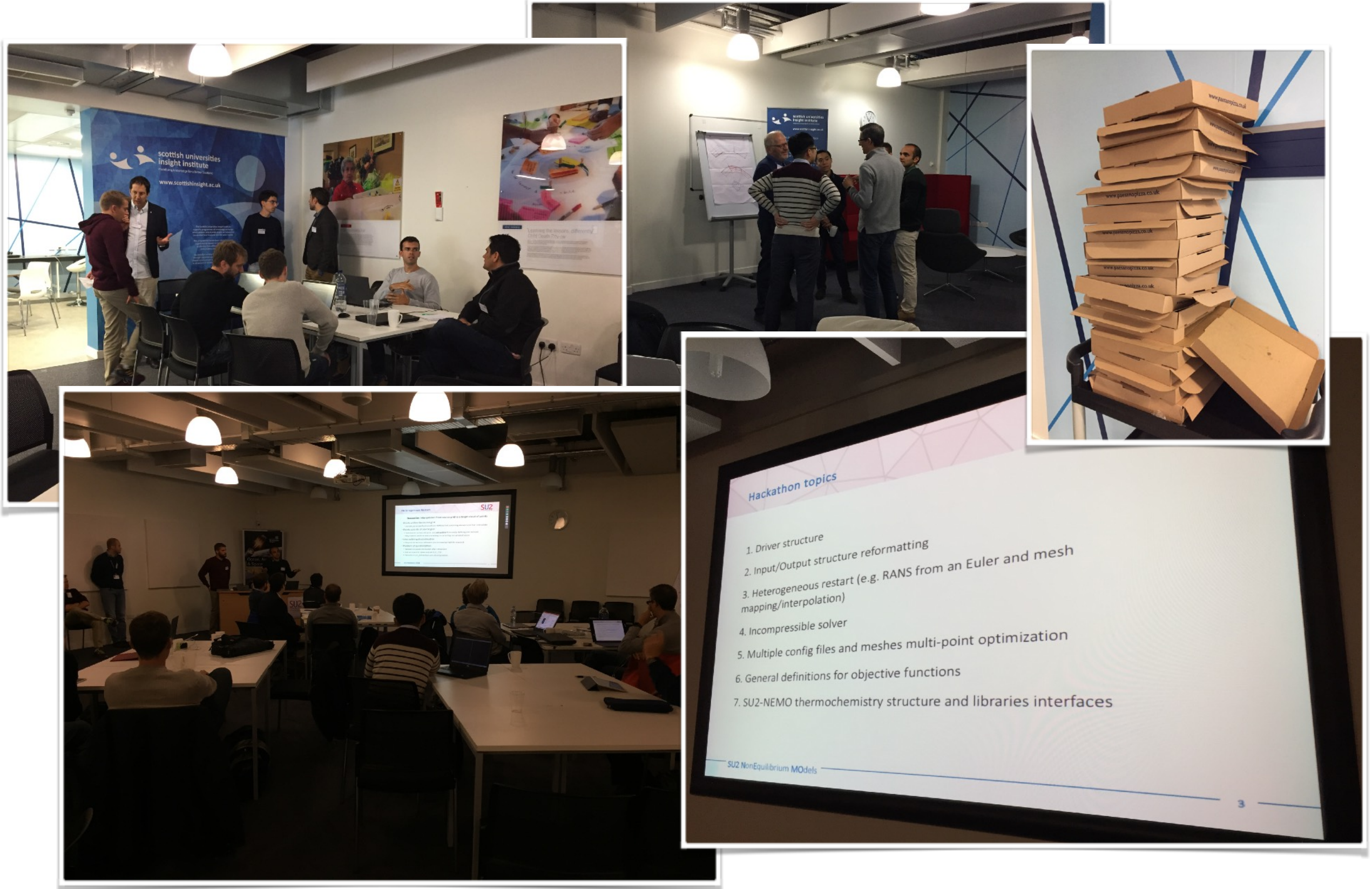
economon merged commit 7256bea into su2code:develop 8 days ago

1 check passed

continuous-integration/travis-ci/pr The Travis CI build passed

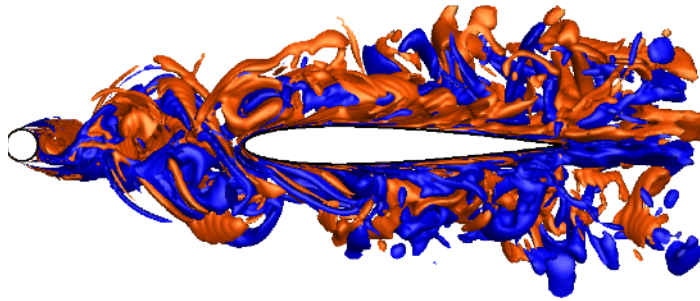
petebachant deleted the petebachant:py2_and_py3_support branch 7 days ago

Hackers Welcome Here.

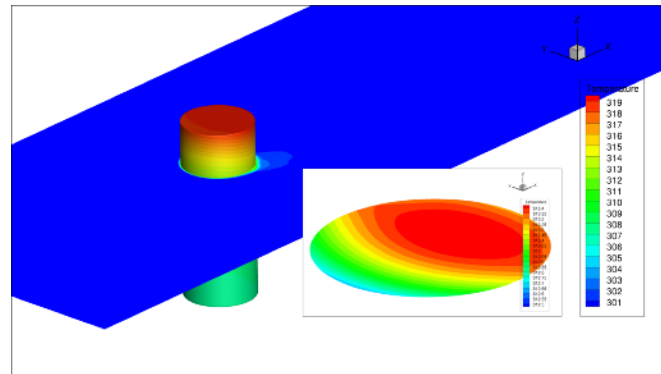


Pictures from our official SU2 Hackathon on Sunday September 16, 2018.

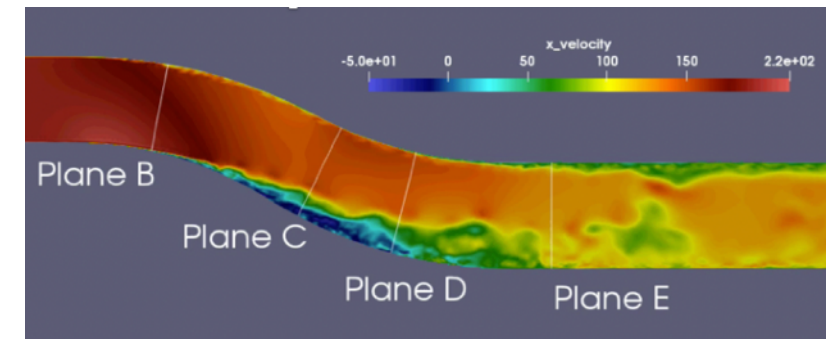
Some Topics for Today



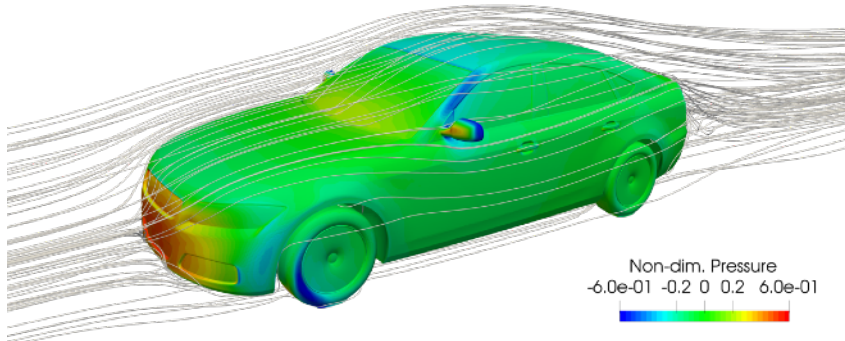
DDES + FWH



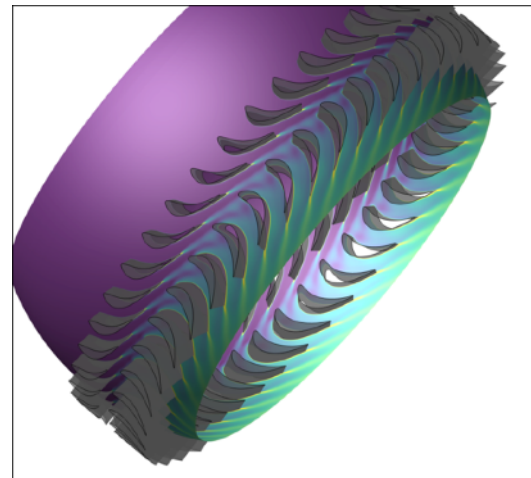
Coupled-Adjoint for CHT



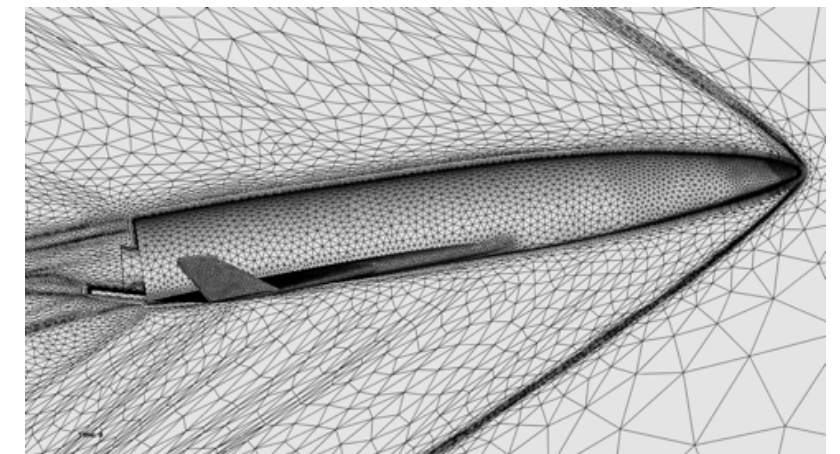
High-Order DG-FEM Solver for iLES/LES/DNS



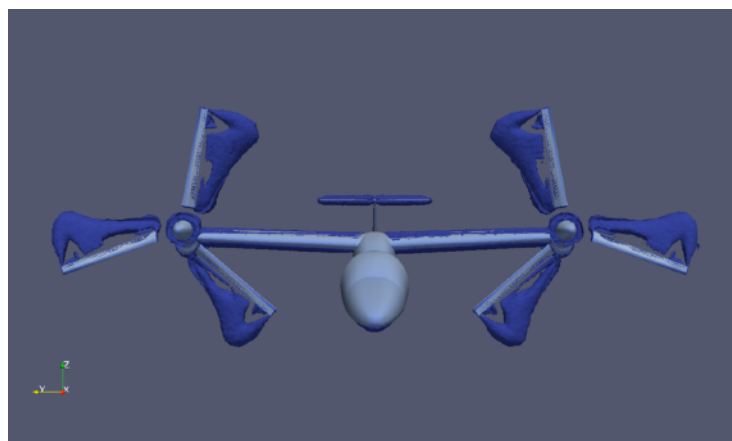
Incompressible Flows



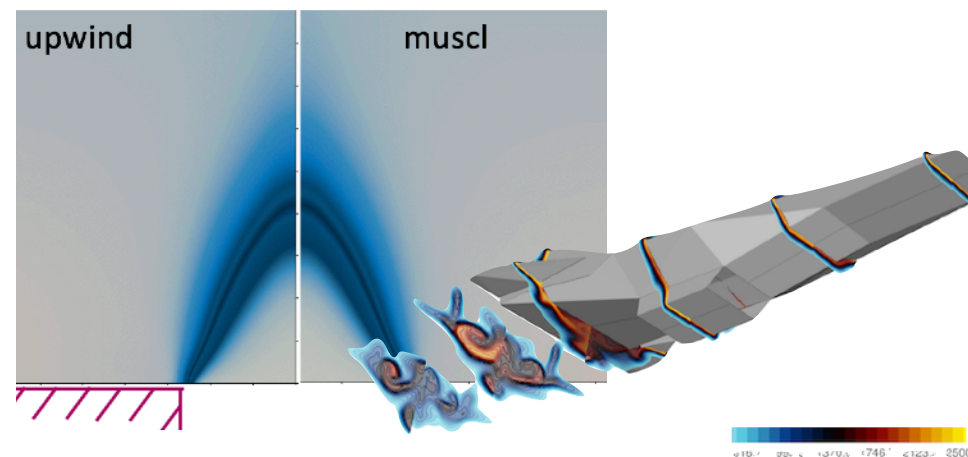
Unsteady Turbomachinery Design



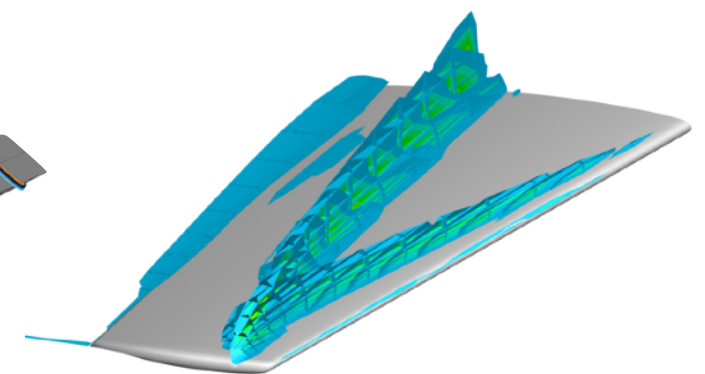
Mesh Adaptation



Rotor-Fuselage Aerodynamics



Non-Equilibrium & Reactive Flows



Uncertainty Quantification for RANS

3rd Annual SU2 Developers Meeting

September 16th-18th, 2018

University of Strathclyde, Scottish Universities Insight Institute (SUII)

Glasgow, Scotland, UK

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0930 – 1000: Conjugate heat transfer problems and computing coupled discrete adjoints using AD, O. Burghardt (TU Kaiserslautern), T. Albring, N. Gauger

1000 – 1030: Coffee break

1030 – 1100: Physics-based RANS model-form UQ in SU2, J. Mukhopadhyaya (Stanford), A. Mishra, J.J. Alonso, G. Iaccarino

1100 – 1130: Aeroacoustics prediction and optimization capabilities in SU2, B. Zhou (NIA/NASA-Langley), T. Albring, N. Gauger, C. Ilario, T. Economon, J.J. Alonso, L. V. Lopes, H. Yao, S. Peng, L. Davidson

1130 – 1200: Higher-order SU2: DG-FEM solver and WENO-FV solver with LES/ILES/WMLES applications, E. van der Weide (U. of Twente), J.J. Alonso, D. Drikakis, K. Singh, P. Urbanczik, E. Molina, J.H. Choi

1200 – 1300: Lunch

1300 – 1330: Unsteady optimization with SU2: application to turbomachinery design, A. Rubino (TU Delft), M. Pini, N. Anand, P. Colonna

1330 – 1400: Preliminary results on rotor-fuselage aerodynamics using SU2: status and challenges, M. Morelli (Politecnico di Milano), G. Gori, A. Guardone

1400 – 1430: Anisotropic mesh adaptation with the INRIA AMG library, A. Loseille (INRIA), V. Menier, B. Munguia, J.J. Alonso

1430 – 1500: Coffee break

1500 – 1530: Simulation and adjoint-based design for variable density incompressible flows with heat transfer, T. Economon (Bosch)

1530 – 1600: Implementation of pressure-based Navier-Stokes for wind energy applications, A. Ravishankara (ECN part of TNO), H. Ozdemir, E. van der Weide

1600 – 1630: SU2-IDS: International Developers Society, T. Albring, R. Sanchez (TU Kaiserslautern), T. Economon, F. Palacios

1630 – 1700: Wrap up, J.J. Alonso (Stanford)

In order to participate (in-person or virtually), please register for the meeting by following the link on the SU2 home page (<https://su2code.github.io>).

*Please note that all stated times are British Summer Time (BST). **The presenter author is underlined

SU2
The Open-Source CFD Code

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