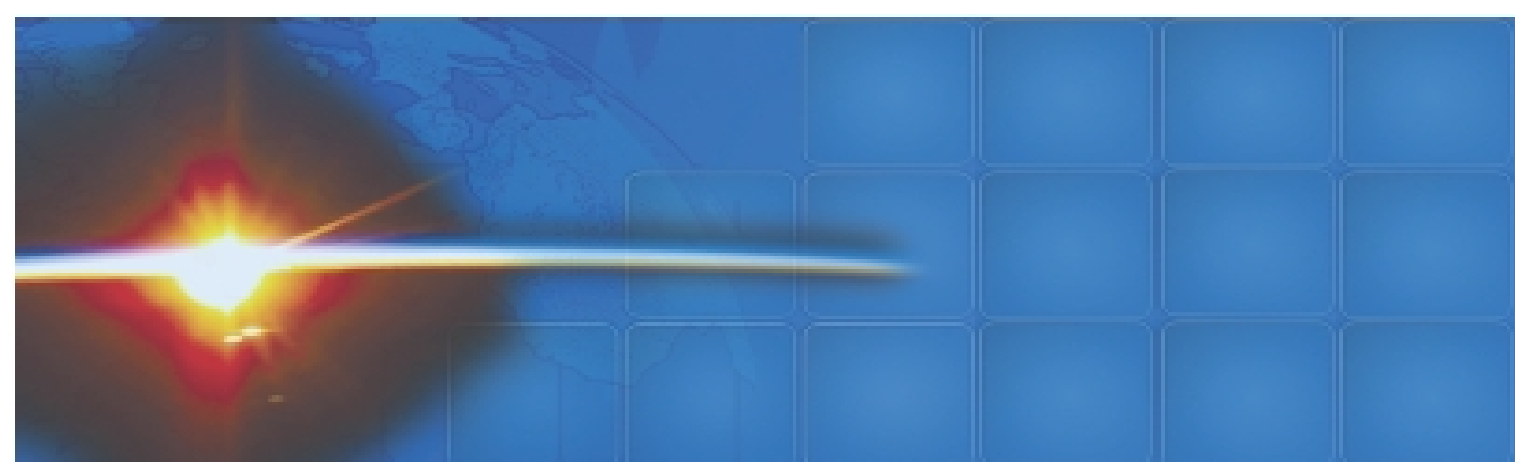
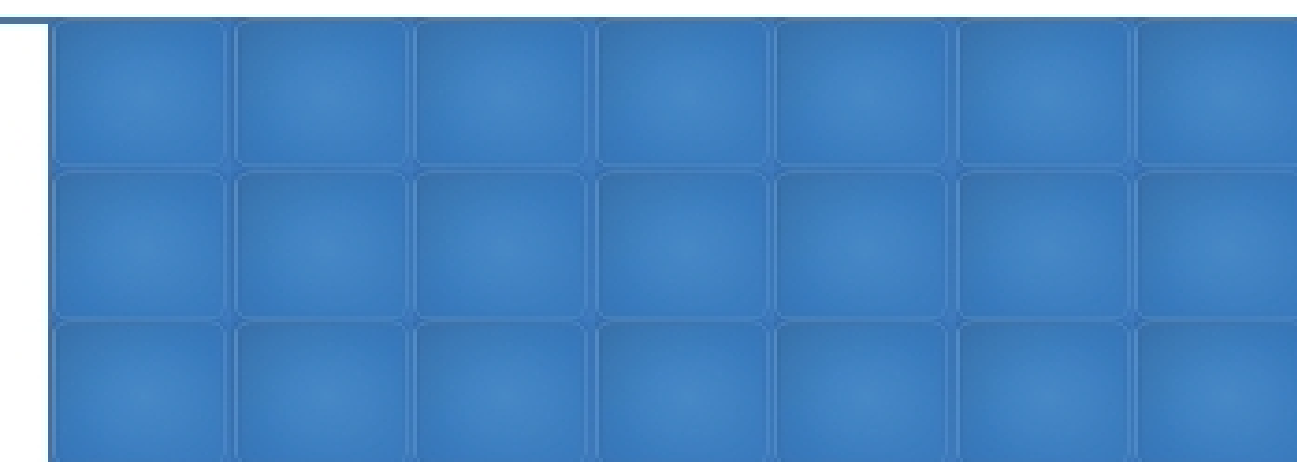




Italian National Agency for New Technologies, Energy and Sustainable Economic Development



# NEPTUNIUS: the ENEA HPC portal for multiphysics simulations

F. Ambrosino<sup>1</sup>, A. Colavincenzo<sup>2</sup>, G. Guarnieri<sup>1</sup>, A. Funel<sup>1</sup>, G. Ponti<sup>1</sup>, A. Mariano<sup>1</sup>, F. Palombi<sup>1</sup>, G. Bracco<sup>1</sup>, S. Migliori<sup>1</sup>

1 - ENEA UTICT-HPC, Department for Computer Science Development and ICT - ITALY

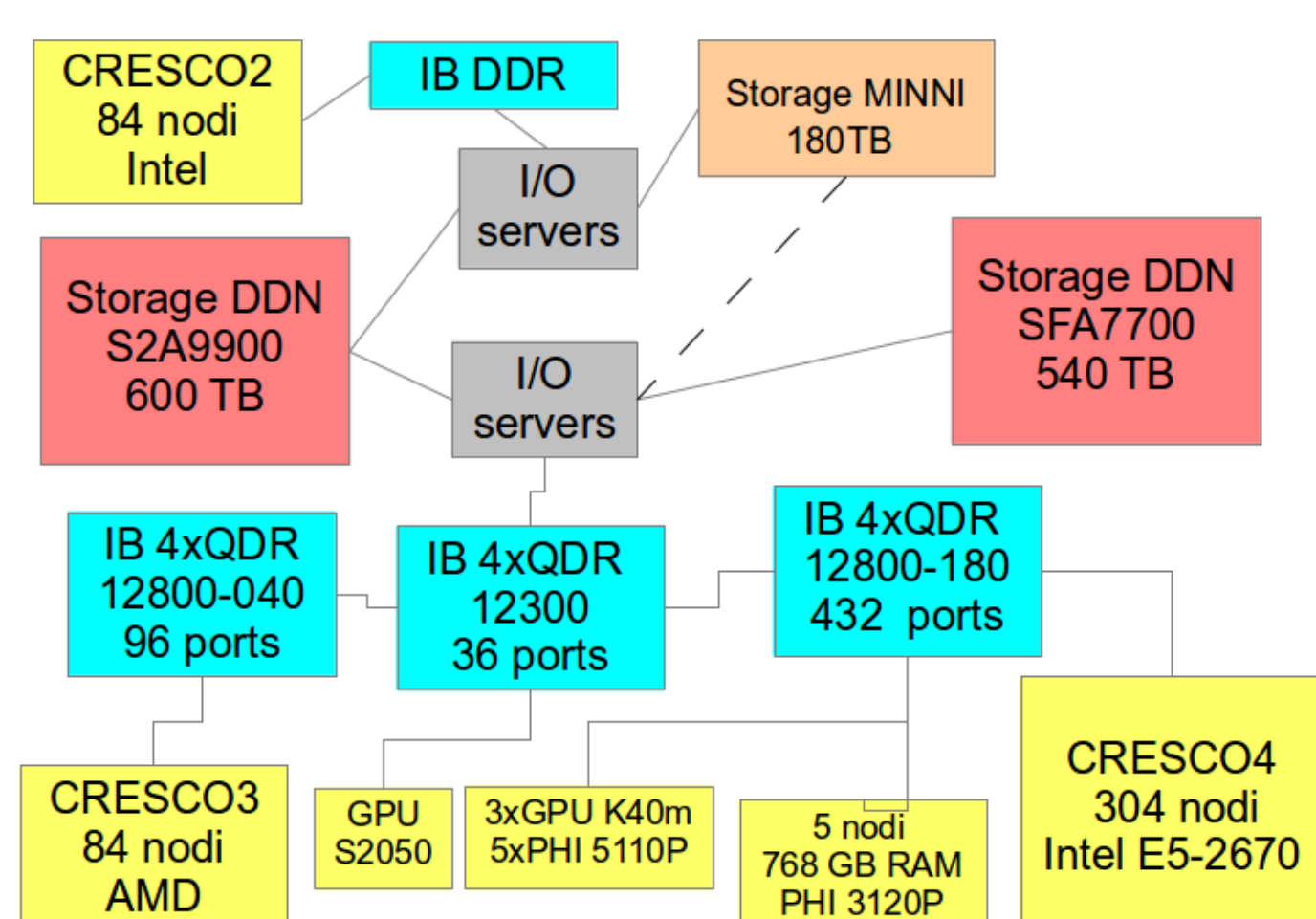
2 - KELYON S.R.L., open business solutions - ITALY

fiorenzo.ambrosino@enea.it - antonio.colavincenzo@kelyon.it - guido.guarnieri@enea.it - agostino.funel@enea.it - giovanni.ponti@enea.it - angelo.mariano@enea.it - filippo.palombi@enea.it - giovanni.bracco@enea.it - silvio.migliori@enea.it

CRESCO hardware capabilities, ENEAGRID software layer, NX/FARO graphical remote access facility are the tripod supporting NEPTUNIUS virtual laboratory

## CRESCO HPC cluster family: highlights

- CRESCO3: 20 Tflops AMD
- CRESCO4: 100 Tflops INTEL
- PHI & CUDA dedicated nodes
- QDR IB interconnection
- 1PB GPFS RDMA storage



## ENEAGRID

- AFS filesystem for users home & software
- Data access via web, AFS client, ssh, FARO
- Main backup: 2 PB tape library (LTO4/6)

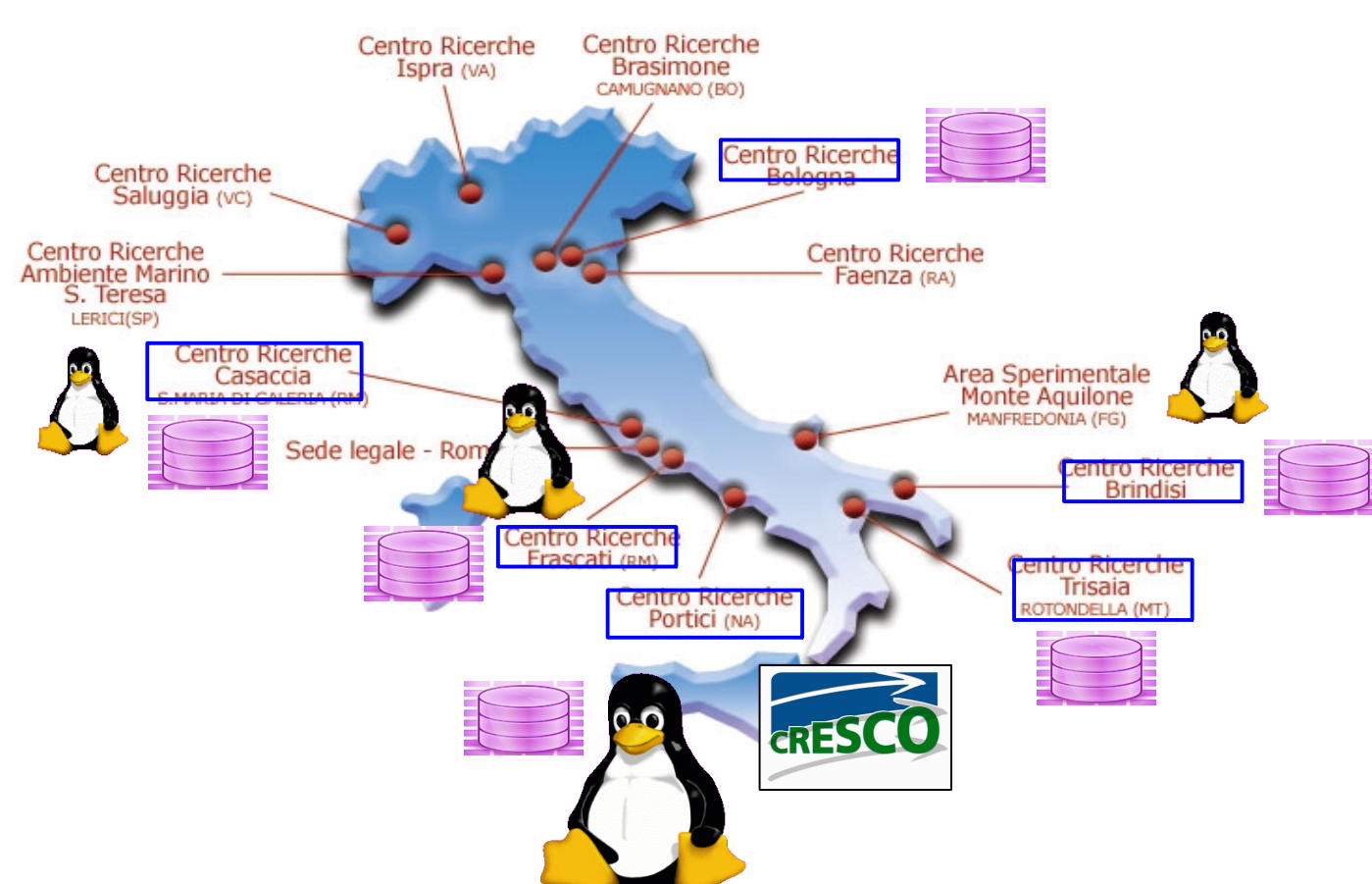
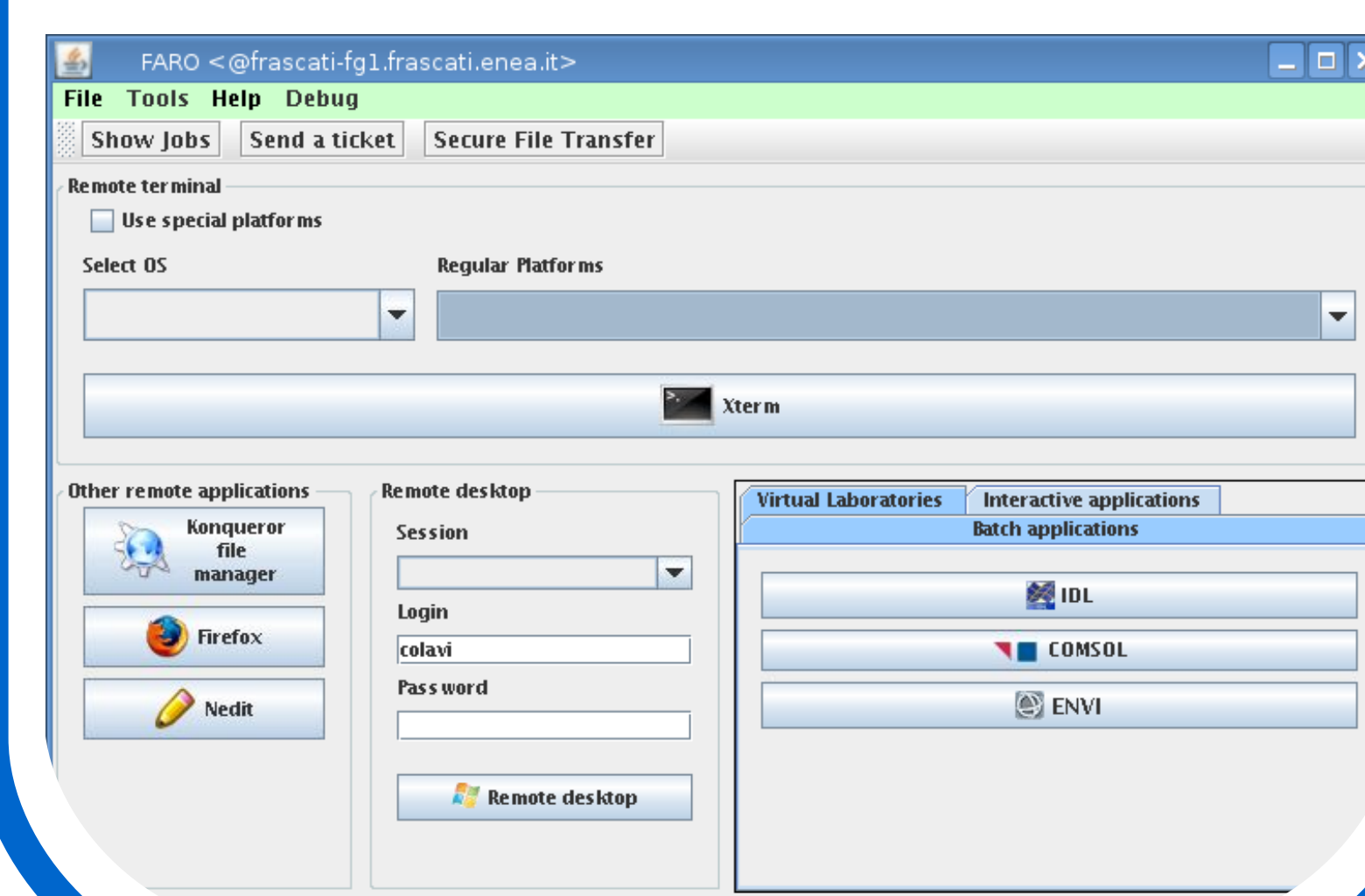
ENEAGRID software published by NEPTUNIUS:

| CFD                                               | FEM                          | Multiphysics                | FSI   |
|---------------------------------------------------|------------------------------|-----------------------------|-------|
| Ansys Fluent<br>Ansys CFX<br>OpenFOAM<br>STAR-CCM | Ansys<br>Nastran<br>Calculix | Comsol<br>Ansys<br>STAR-CCM | MpCCI |
| Pre/Post-Processing<br>Paraview<br>Gambit         |                              |                             |       |

NEPTUNIUS is the key for engineers and modeling experts to an immediate and effective usage of HPC resources. The Java GUI is organized in subject tabs to provide easy access to CFD and multiphysics software, automating key tasks such as running software in both interactive and batch mode.

## NX and FARO: an easy to use remote desktop & remote application facility

- Web enabled (NX protocol)
- Java based
- Highly available

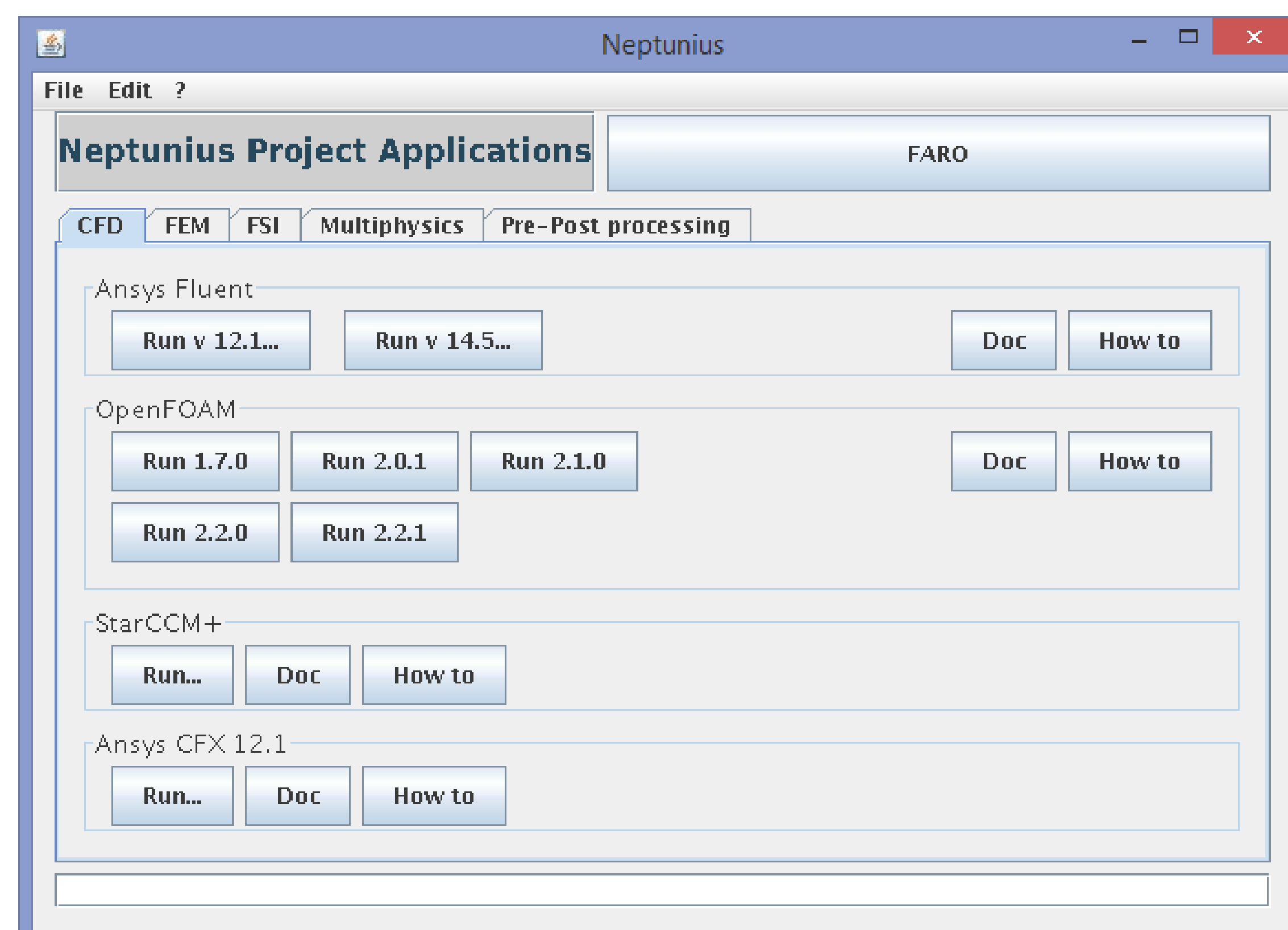


ENEAGRID: ENEA HPC map

## What is an ENEAGRID virtual laboratory?

Virtual labs are easily accessible gateways tailored around several scientific or thematic fields.

Made to exploit and streamline HPC usage masking and simplifying the underlying job submission and user data input via a web based GUI.



NEPTUNIUS Java interface



EDOC@WORK3.0  
EDUCATION AND WORK ON CLOUD

FARO and NEPTUNIUS portal have also been improved and maintained under the VIS4FACTORY and EDOC@WORK3.0 projects, endeavour co-funded by European Regional Development Funds within the programme "PON Ricerca e Competitività 2007-2013" by the Italian Ministry for Education, University and Research and the Italian Ministry for Economic Development.

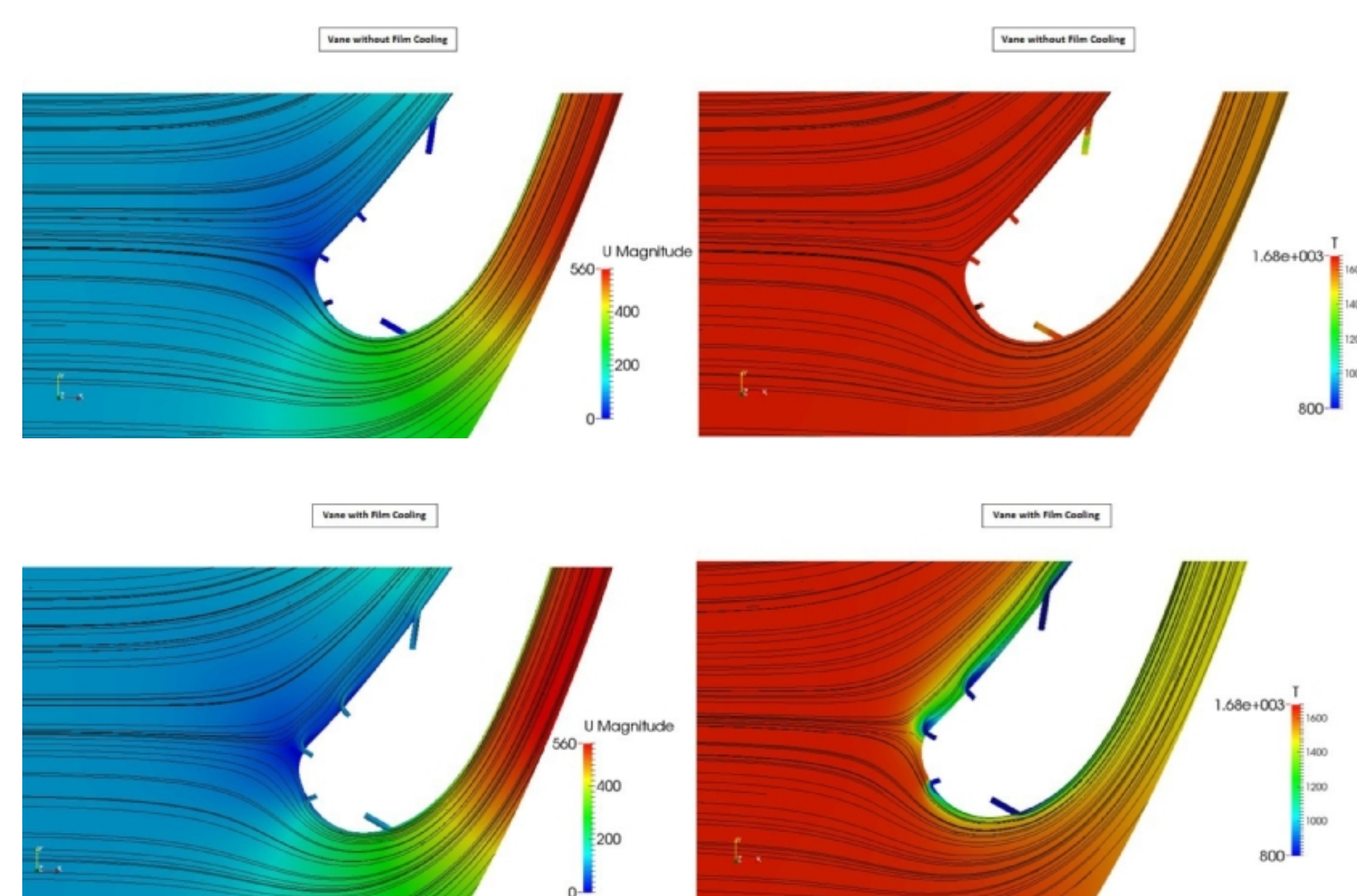
vis4factory

All CRESCO hardware resources have been acquired under the LAMRECOR; ITH@CA; VIS4FACTORY; TEDAT; AQUASYSTEM projects, endeavour co-funded by European Regional Development Funds within the programme "PON Ricerca e Competitività 2007-2013" by the Italian Ministry for Education, University and Research and the Italian Ministry for Economic Development.

Otherwise funded by ENEA technical units UTTEI; UTMEA; UTVALAMB in a joint arrangement with UTICT.

## NEPTUNIUS virtual lab usage examples

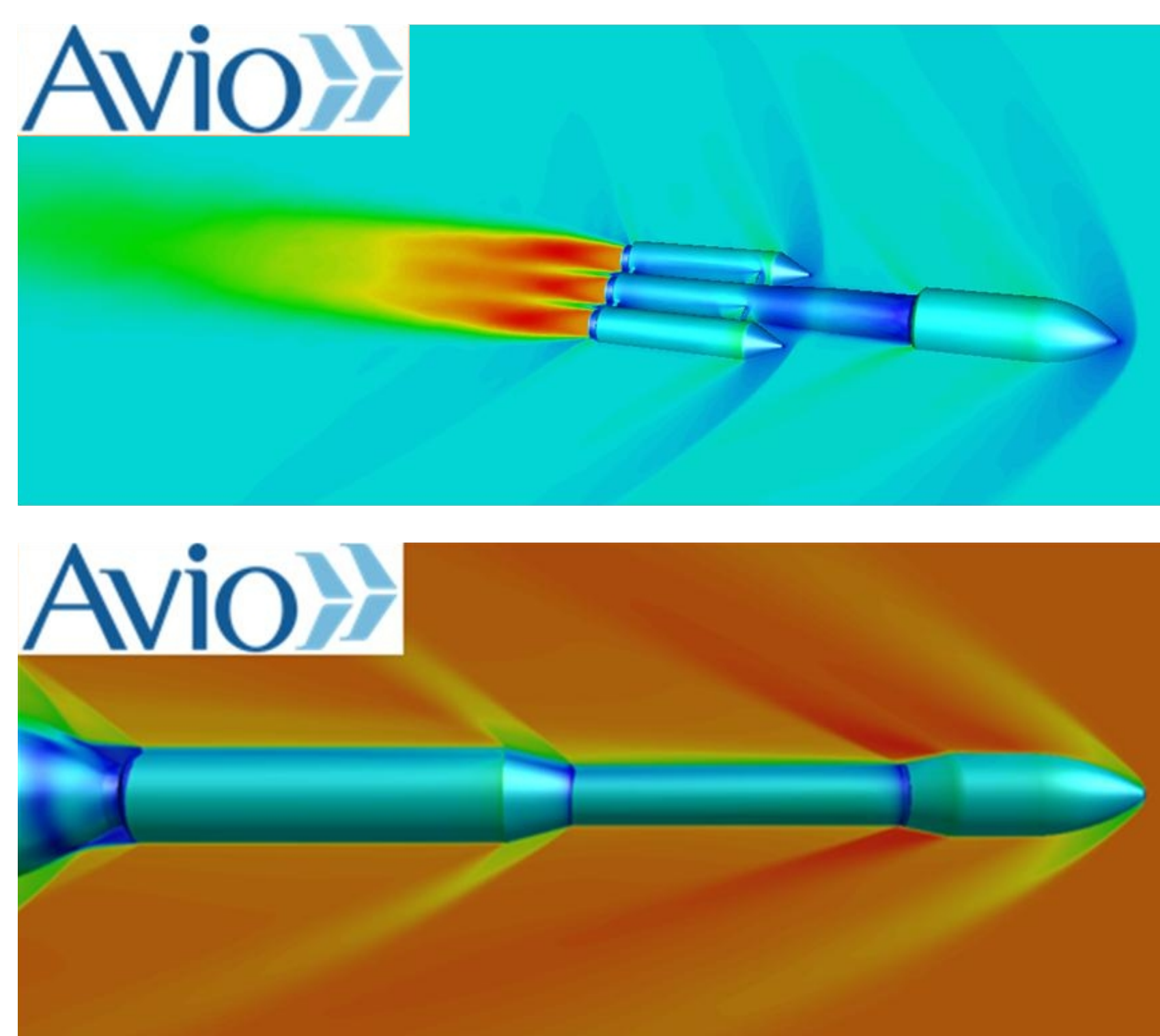
### OpenFOAM - "Study of particles deposition in gas turbine blades in presence of film cooling"



Proceedings of ASME Turbo Expo 2014: Power for Land, Sea and Air  
June 16-20, 2014, Dusseldorf, Germany

Image: courtesy of D. Borrello et al.

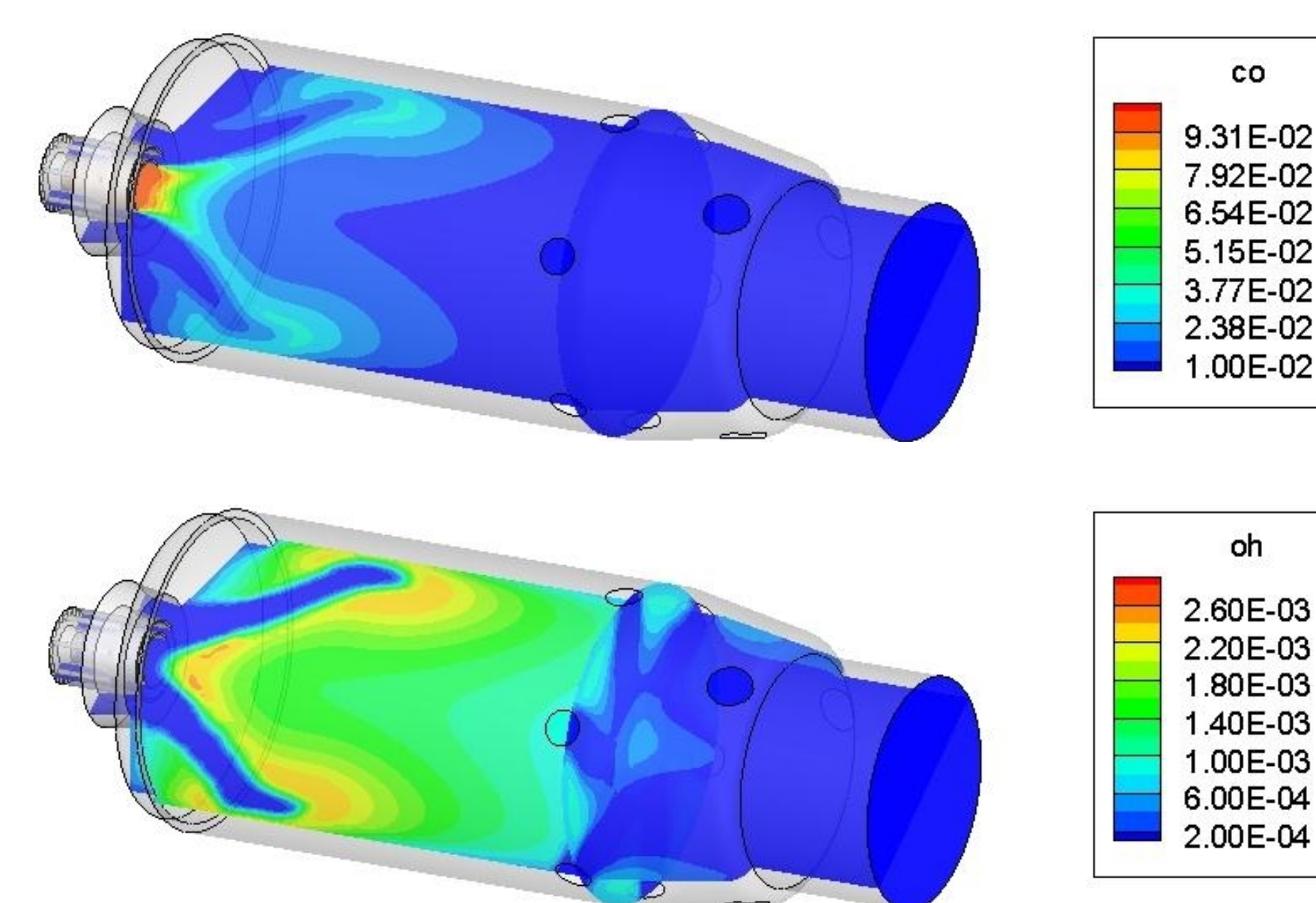
### AnsysFLUENT - Ariane 6 and Vega launcher aerodynamic CFD simulation



ENEA - GE Avio joint research agreement

Image: courtesy of GE Avio S.r.l.

### AnsysFLUENT - "CFD testing of a conventional gas turbine burner operating in oxy-fuel combustion"



French Italian Joint Combustion Meeting, IFRF and The Combustion Institute - April 23-24, 2014, Hotel San Ranieri, Pisa, Italy

Image: courtesy of G. Calchetti, A. Di Nardo