CINECA
consorzio interuniversitario

HPC and CAE: the CINECA offer

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Agenda

- CINECA 2.0: the italian infrastructure for HPC
- CINECA services for industry
- Improving your competitiveness choosing CINECA

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- **CINECA 2.0: the italian infrastructure for HPC**
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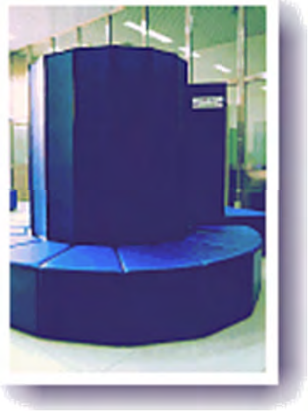
CINECA 2.0: a step forward to the future

CINECA is a non profit Consortium, made up of 54 Italian universities, The National Institute of Oceanography and Experimental Geophysics - OGS, the CNR (National Research Council), and the Ministry of Education, University and Research (MIUR).

CINECA is the largest Italian computing centre, one of the most important worldwide.
It operates in the technological transfer sector through high performance scientific computing, the management and development of networks and web based services, and the development of complex information systems for treating large amounts of data.
It develops advanced Information Technology applications and services, acting like a trait-d'union between the academic world, the sphere of pure research and the world of industry and Public Administration.

The Story

1969:	CDC 6600	1st system for scientific computing
1975:	CDC 7600	1st supercomputer
1985:	Cray X-MP / 4 8	1st vector supercomputer
1989:	Cray Y-MP / 4 64	
1993:	Cray C-90 / 2 128	
1994:	Cray T3D 64	1st parallel supercomputer
1995:	Cray T3D 128	
1998:	Cray T3E 256	1st MPP supercomputer
2002:	IBM SP4 512	1 Teraflops
2005:	IBM SP5 512	
2006:	IBM BCX	10 Teraflops
2009:	IBM SP6	100 Teraflops
2012:	**IBM BG/Q**	**2 Petaflops**

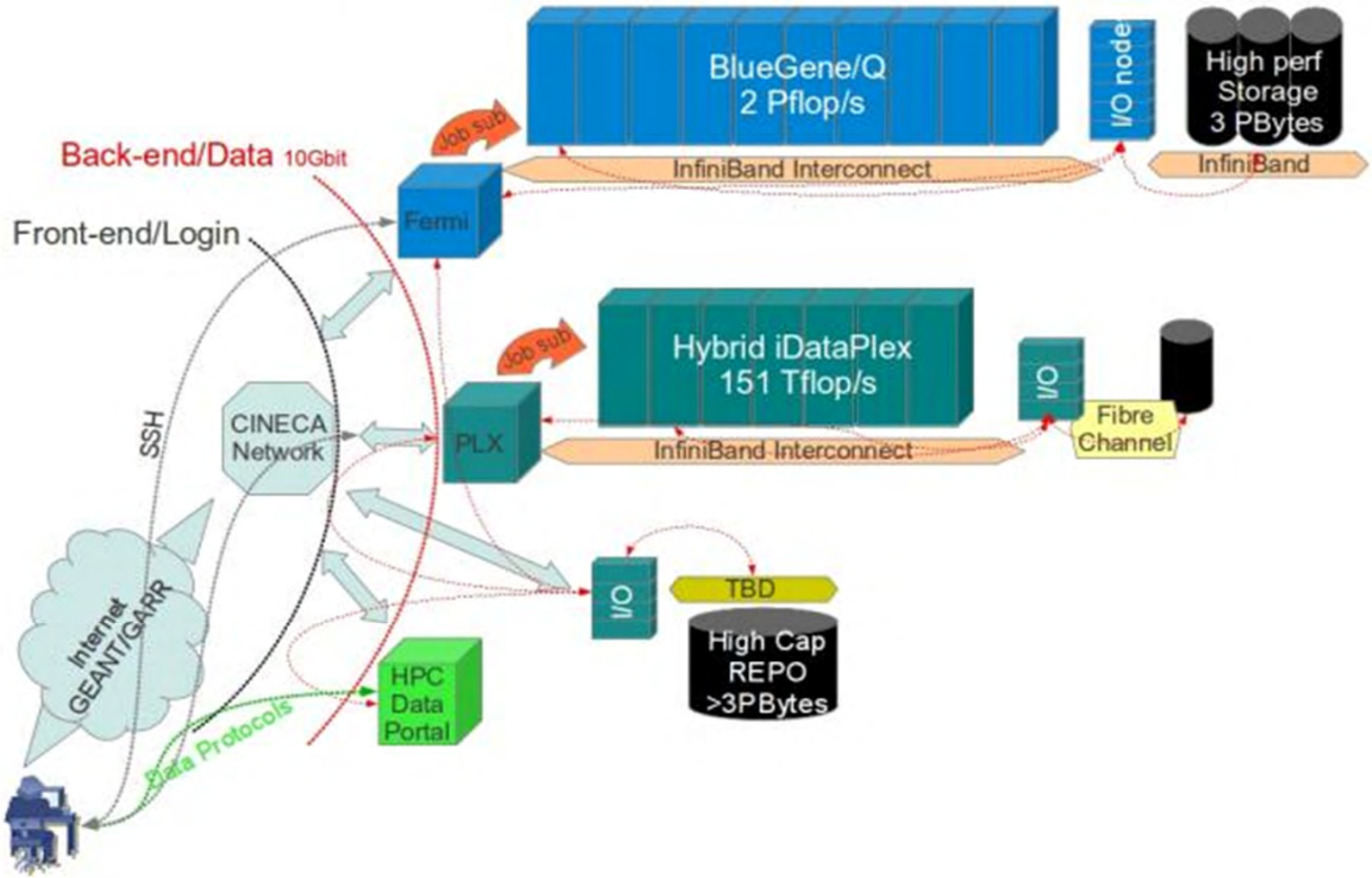


CINECA and TOP500

#7 June 2012

		Computer
1	DOE/NNSA/LLNL United States	**Sequoia** - BlueGene/Q, Power BQC 16C 1.60 GHz, Custom IBM
2	RIKEN Advanced Institute for Computational Science (AICS) Japan	K computer, SPARC64 VIIIfx 2.0GHz, Tofu interconnect Fujitsu
3	DOE/SC/Argonne National Laboratory United States	**Mira** - BlueGene/Q, Power BQC 16C 1.60GHz, Custom IBM
4	Leibniz Rechenzentrum Germany	**SuperMUC** - iDataPlex DX360M4, Xeon E5-2680 8C 2.70GHz, Infiniband FDR IBM
5	National Supercomputing Center in Tianjin China	**Tianhe-1A** - NUDT YH MPP, Xeon X5670 6C 2.93 GHz, NVIDIA 2050 NUDT
6	DOE/SC/Oak Ridge National Laboratory	**Jaguar** - Cray XK6, Opteron 6274 16C 2.200GHz, Cray Gemini interconnect, NVIDIA 2090
7	CINECA Italy	**Fermi** - BlueGene/Q, Power BQC 16C 1.60 IBM
8	Germany	IBM
9	CEA/TGCC-GENCI France	**Curie thin nodes** - Bullx B510, Xeon E5-2680 8C 2.700GHz, Infiniband QDR Bull
10	National Supercomputing Centre in Shenzhen (NSCS) China	**Nebulae** - Dawning TC3600 Blade System, Xeon X5650 6C 2.66GHz, Infiniband QDR, NVIDIA 2050 Dawning

CINECA HPC Infrastructure



FERMI@CINECA

Architecture: 10 BG/Q Frames
Model: IBM-BG/Q
Processor type: IBM PowerA2 @1.6 GHz
Computing Cores: 163840
Computing Nodes: 10240
RAM: 1GByte / core (163 PByte total)
Internal Network: 5D Torus
Disk Space: 2PByte of scratch space
Peak Performance: 2PFlop/s

N. 7 in Top 500 rank (June 2012)

National and PRACE Tier-0 calls

IBM Cluster linux

PLX@CINECA

Processor type: 2 six-cores Intel Xeon (Exa-Core Westmere)

X 5645 @ 2.4 GHz, 12MB Cache

N. of nodes / cores: 274 / 3288

RAM: 48 GB/Compute node (14 TB in total)

Internal Network: Infiniband with 4x QDR switches (40 Gbps)

Acccelerators: 2 GPUs NVIDIA M2070 per node

548 GPUs in total

Peak performance: 32 TFlops

565 TFlops SP GPUs

283 TFlops DP GPUs

Visualization system

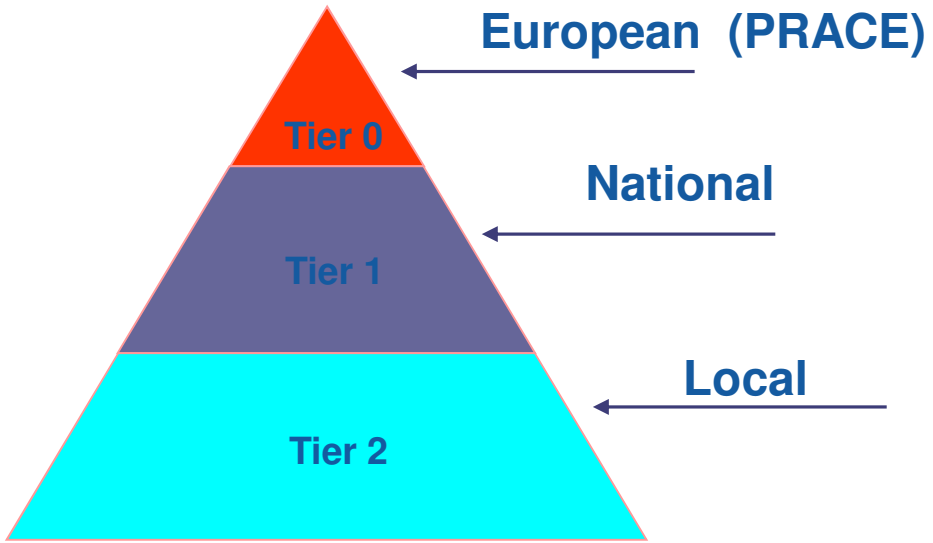
Visualization and computer graphycs
Virtual Theater
6 video-projectors BARCO SIM5
Audio surround system
Cylindric screen 9.4x2.7 m, angle 120°
Ws + Nvidia cards

RVN nodes and HP DL980 on PLX system

Storage Infrastructure

System	Available bandwidth (GB/s)	Space (TB)	Connection Tecnology	Disk Tecnology
2 x S2A9500	3,2	140	FCP 4Gb/s	FC
4 x S2A9500	3,2	140	FCP 4Gb/s	FC
6 x DCS9900	5,0	540	FCP 8Gb/s	SATA
4 x DCS9900	5,0	720	FCP 4Gb/s	SATA
3 x DCS9900	5,0	1500	FCP 4Gb/s	SATA
Hitachi Ds	3,2	360	FCP 4Gb/s	SATA
3 x SFA1000	10,0	2200	QDR	SATA
1 x IBM5100	3,2	66	FCP 8Gb/s	FC
		> 5,6 PB		

The European HPC-Ecosystem



Creation of a European HPC ecosystem involving all stakeholders

- ✓ HPC service providers on all tiers
- ✓ Scientific and industrial user communities
- ✓ The European HPC hw and sw industry

PRACE Research Infrastructure (www.prace-ri.eu): the top level of the European HPC ecosystem

CINECA:

- represents Italy in PRACE
- hosting member in PRACE
  - Tier-0 system
    BG/Q 2 PFlop/s
  - Tier-1 system
    > 5 % PLX
- involved in PRACE 1IP, 2IP,3IP
- PRACE 2IP prototype EoI

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CINECA and Industry

CINECA provides:

- ***Infrastructure*** (CPU cycles, visualization, data, housing)
- ***Support and consulence***(in collaboration with Enginsoft)
- ***Training***

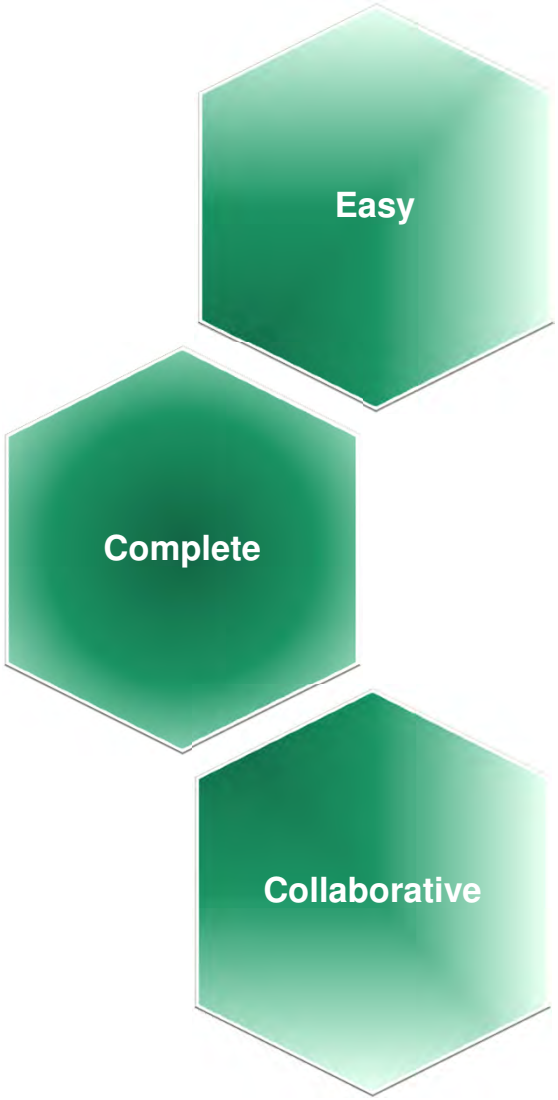
CINECA and Industry

Who are our main customers:

- ENI (geophysics)
- Luna Rossa (America's Cup, CFD)
- BMW-Oracle (America's cup, CFD, structure)
- ARPA (meteo forecasts, climatology)
- Dompé (pharma)

CINECA hosts and manages HPC infrastructure of ENI:
HP ProLiant SL390s G7 Xeon 6C X5650, Infiniband,
Cluster Linux HP, 15360 cores
N. 60 Top 500 (June 2011) 163.43 Tflop/s Peak, 131.2 Linpack

HPC cloud offering

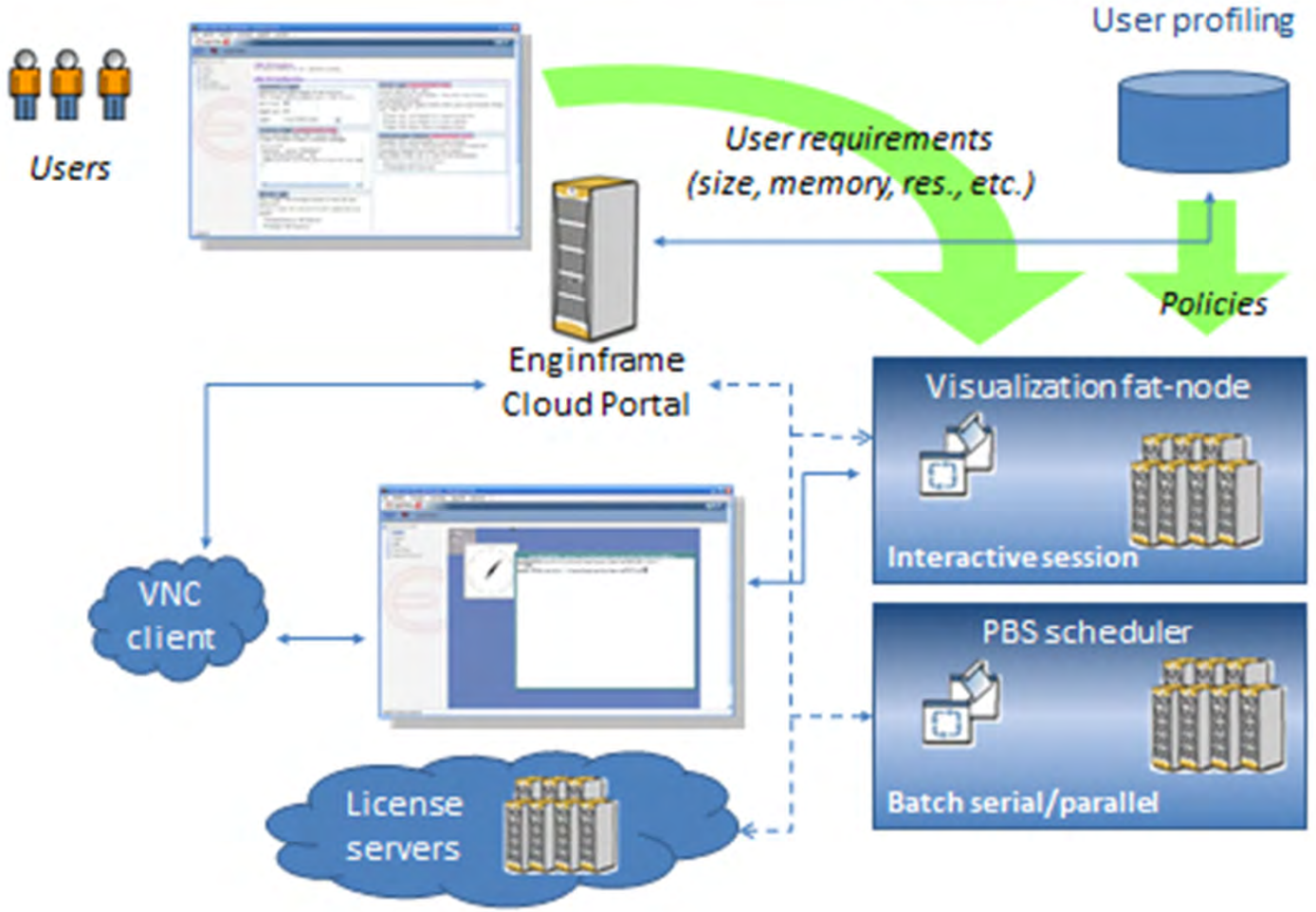


Everything may be managed through a web interface

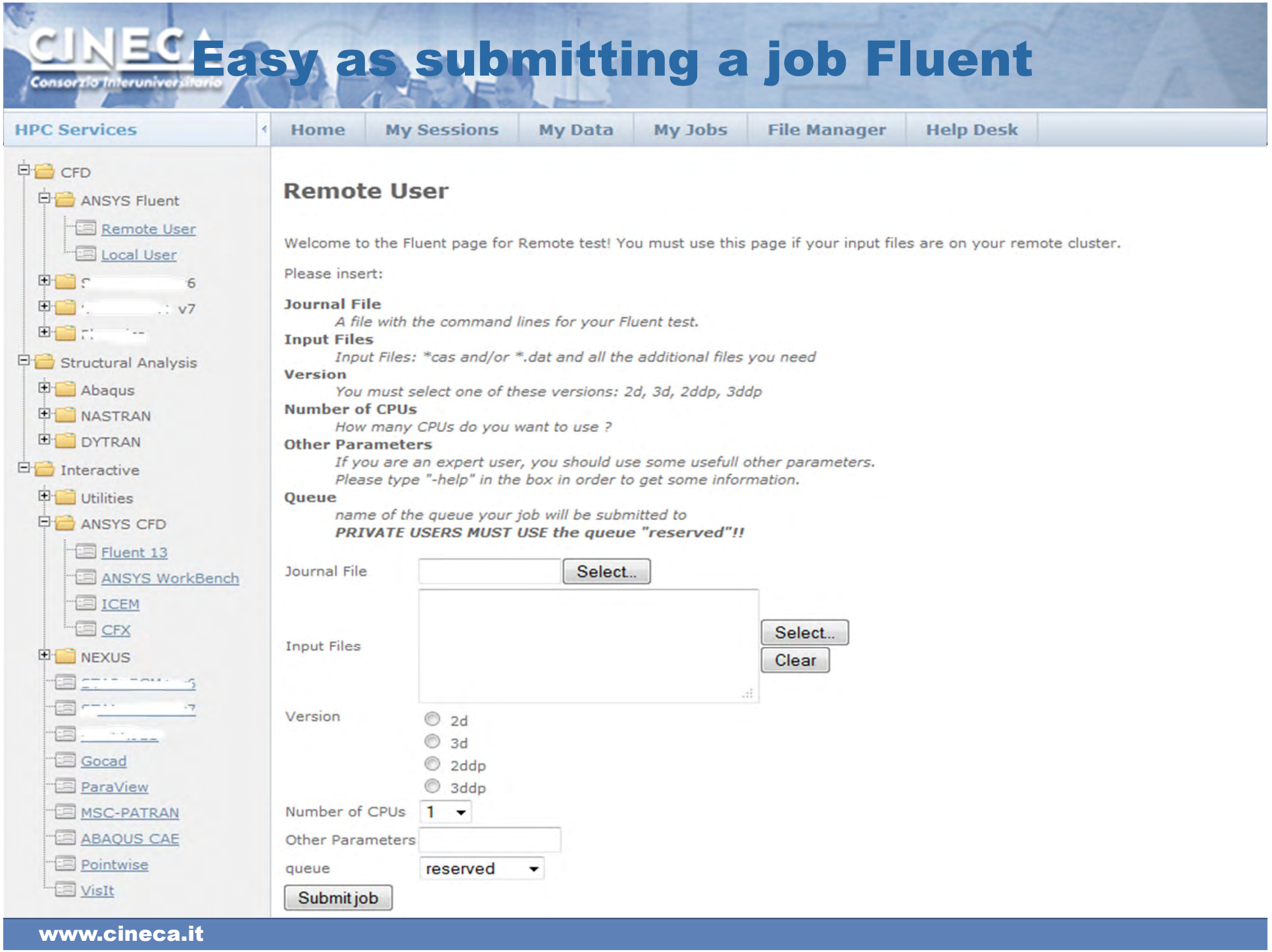
One-stop-shop: Simulation and pre/post processing visualization

Technicians far away may work together seeing and manipulating the same GUI

Desktop Cloud Visualization



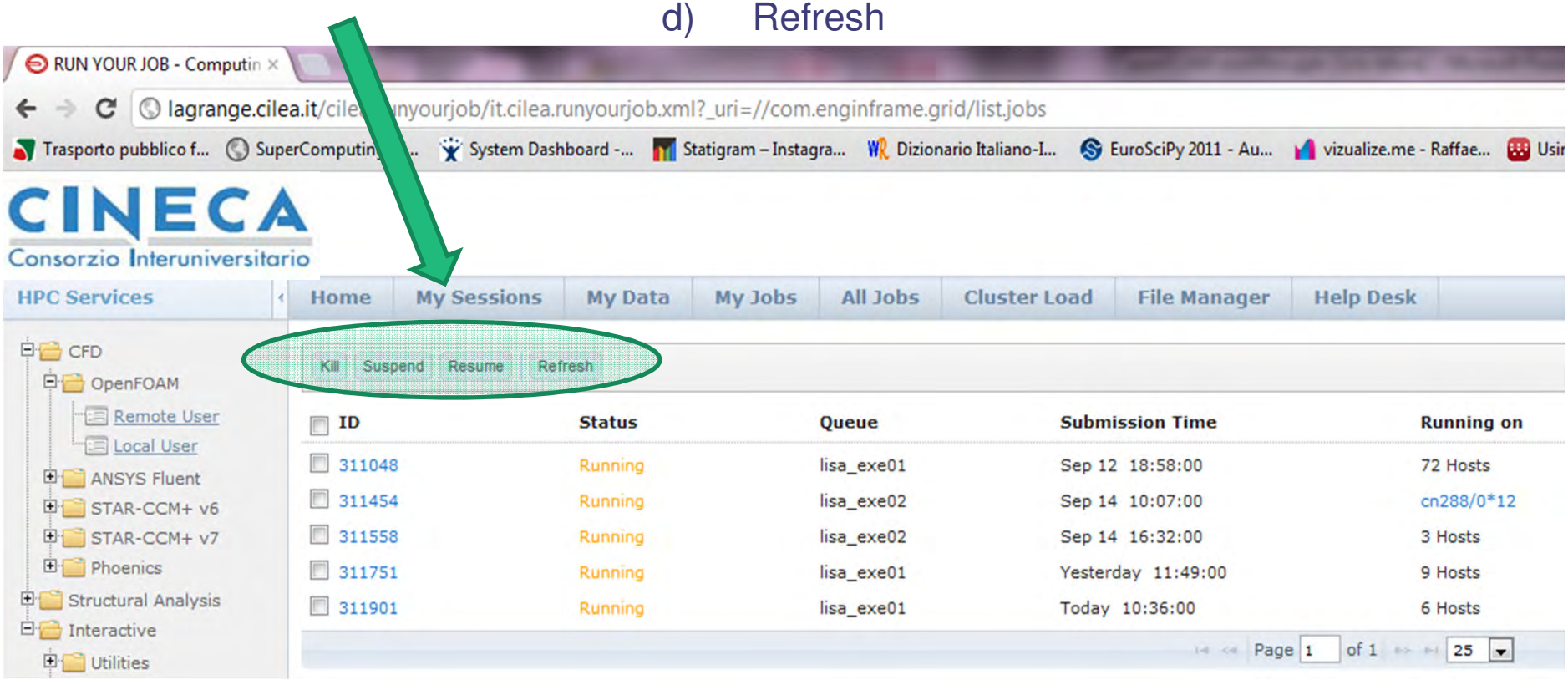
Easy as submitting a job Fluent



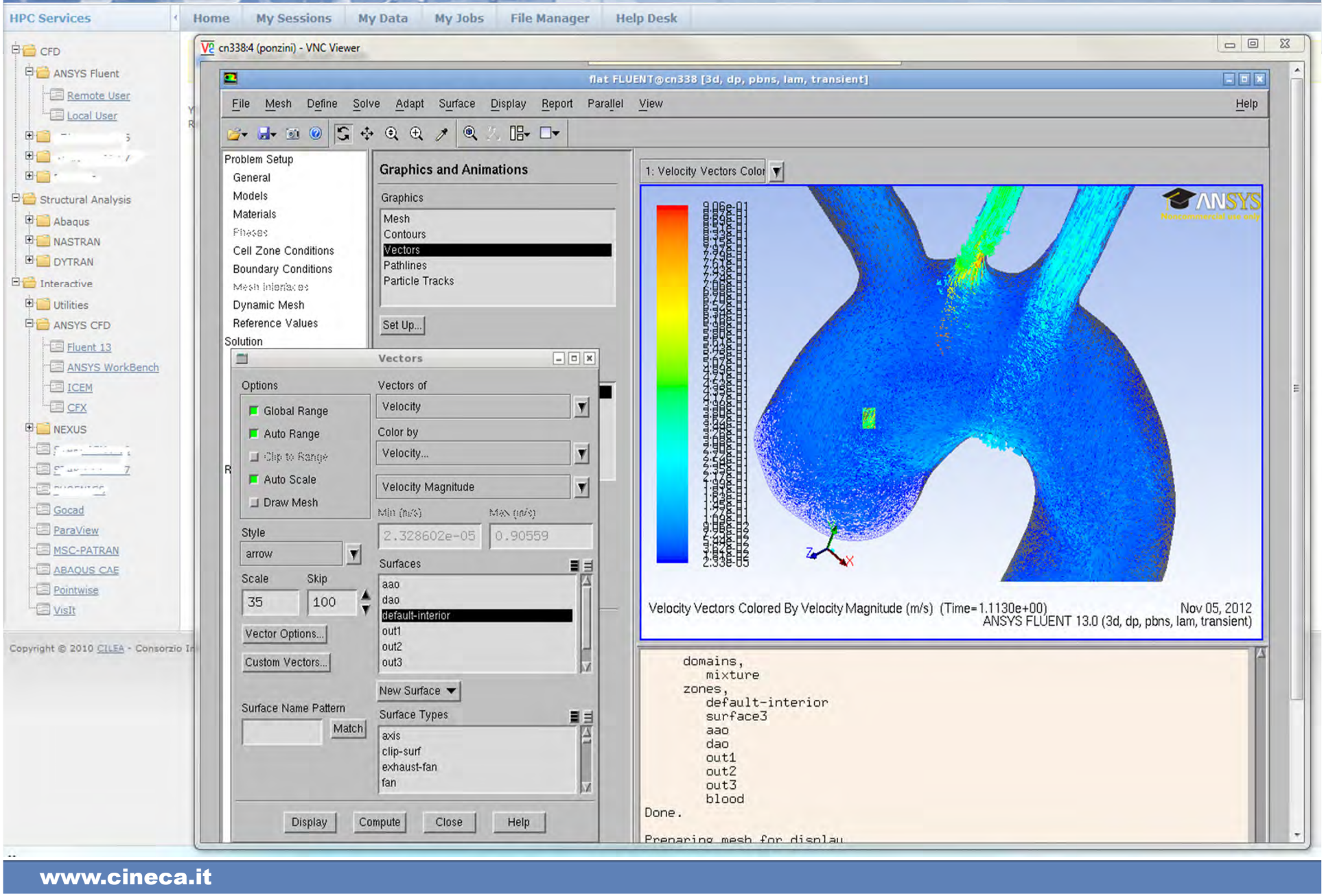
Managing own runs

Using My Jobs panel you have the list of your batch jobs (executing/in wait) and you may interact with them with:

a) Kill
b) Suspend
c) Resume
d) Refresh

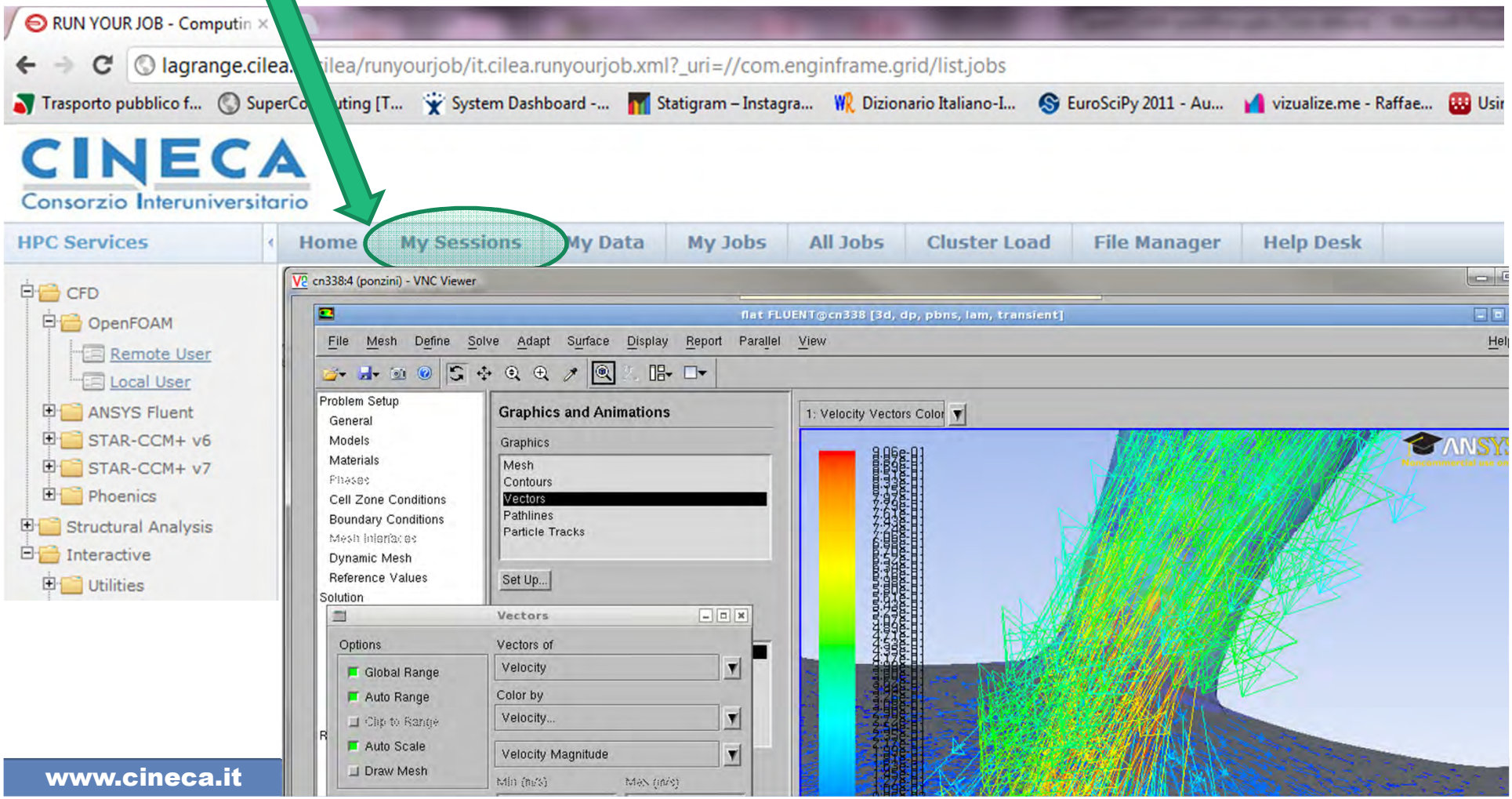


Visualizing like on your own workstation



Collaborating

Using My sessions panel you may share the GUI with other users who will not only see what we are seeing but even interact.



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Reduce infrastrucural costs

- Computing is paid on-demand
  - Starting from 15 Euro-cent per hour
- Our computing systems are constantly upgraded
  - A new Intel Sandy Bridge-cpus cluster in 1Q2013
- Even pre/post may be handled remotely
  - 10 fat-nodes with 128 GB di RAM e 1 with 512 GB
- We have the most performing infrastructure for each software
  - 2 GPU M2070 per node
  - Xeon Phi arriving

Reducing training costs

- Our training courses have an unbeatable price
- If you know how to use a browser you know how to use our supercomputer

Accelerating time-to-market

- Dare going up with parallelism!
  - We tested real cases with ANSYS solvers efficient up to >1000 parallel processes
- Dare the optimization!
  - Not only high performance but high throughput
- GPU-enabled solvers arrive every day on the market
  - For CAE codes a typical gain is 2-5X

You want more?

- Ask your ISV a cloud-like licensing model!