ESTECO Innovation Milestones and Technology Overview

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Board member and Scientific Advisor

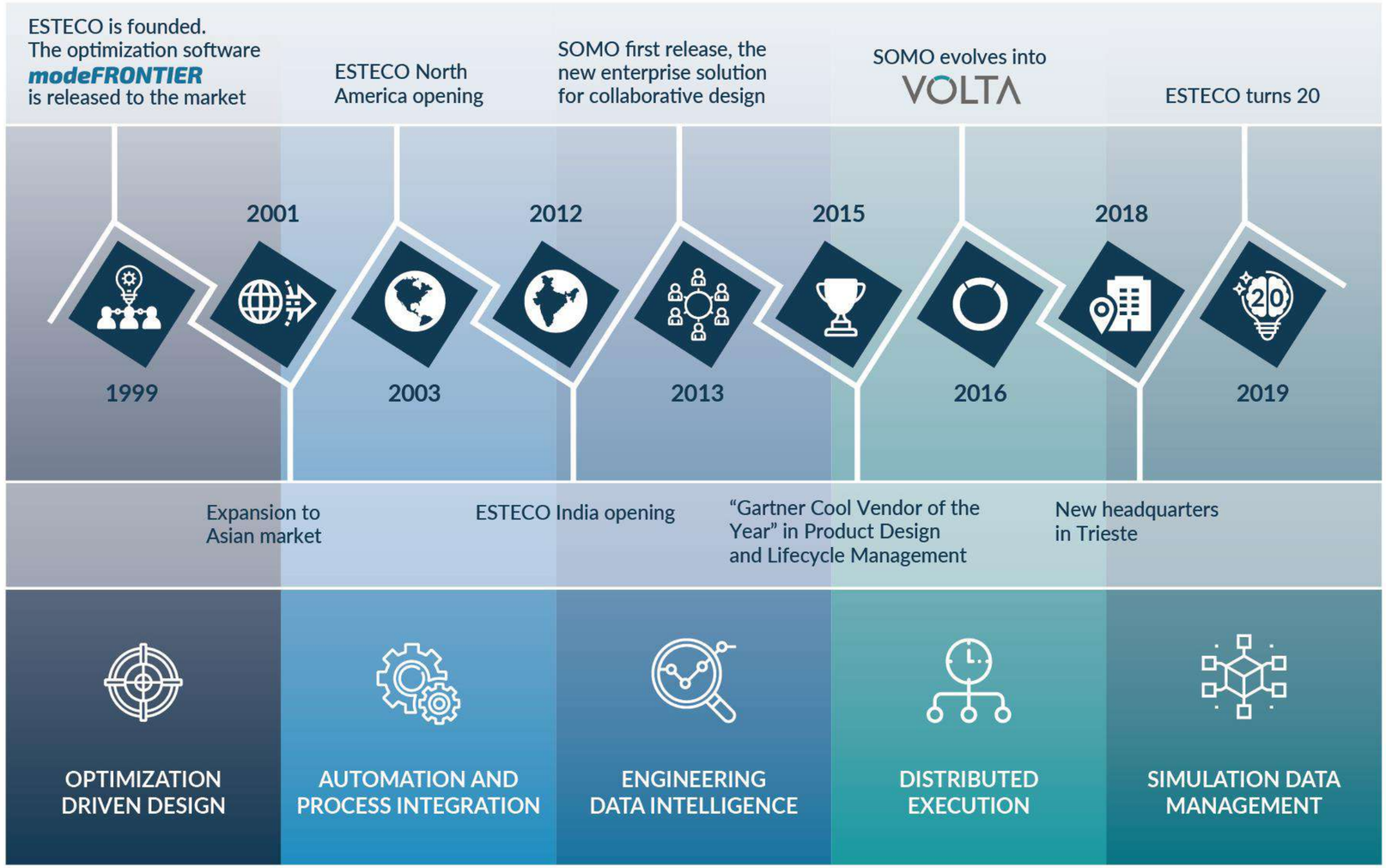
ESTECO Users' Meeting India 2023, Bengaluru, Karnataka, August 23

ESTECO is an independent software company, highly specialized in **numerical optimization** and **simulation process and data management**.

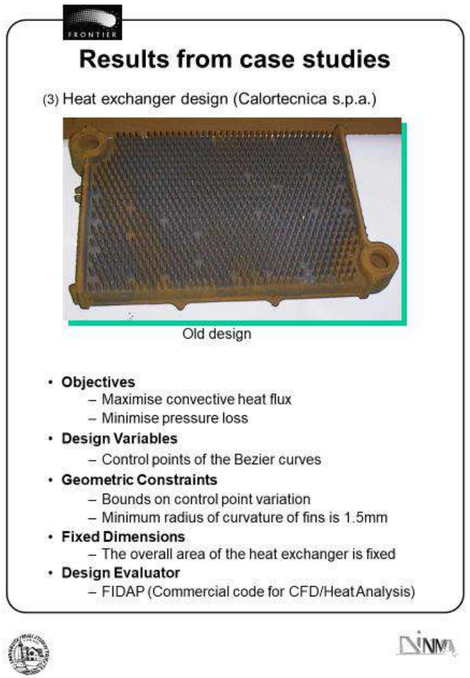

ESTECO SOFTWARE TECHNOLOGY
INNOVATE FASTER

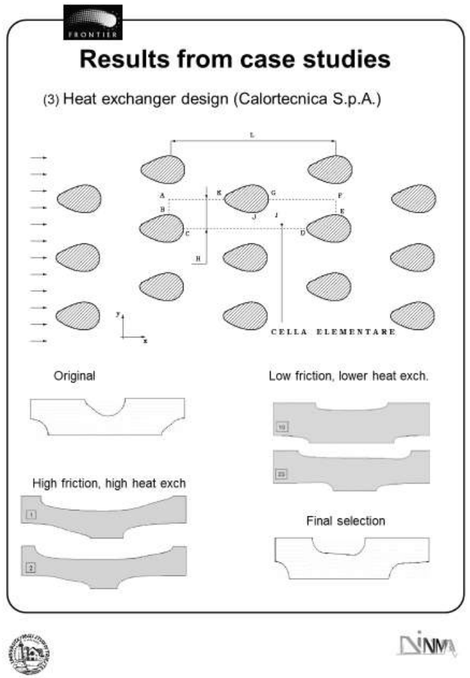
20+ years of innovation

ESTECO was founded after a successful EU project code-named “FRONTIER”



Pioneering time

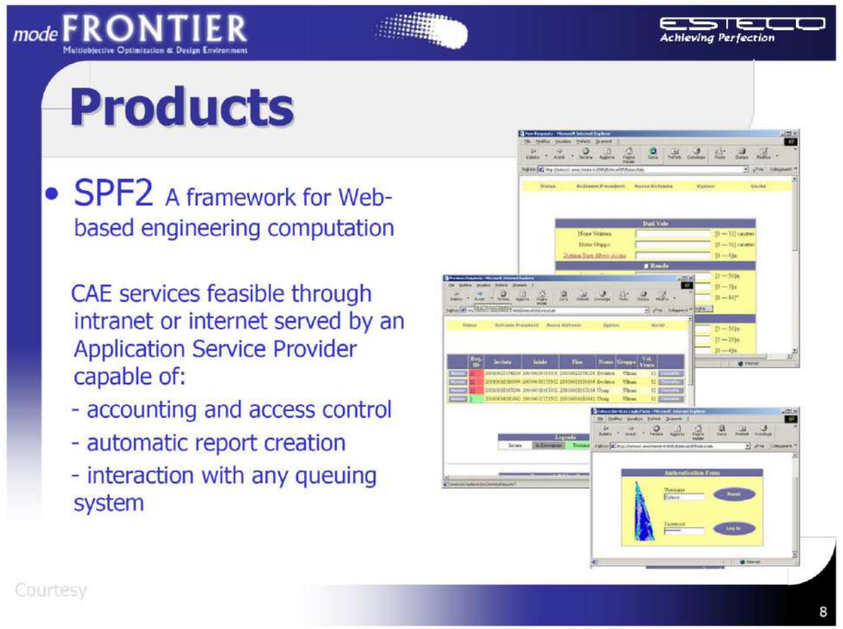


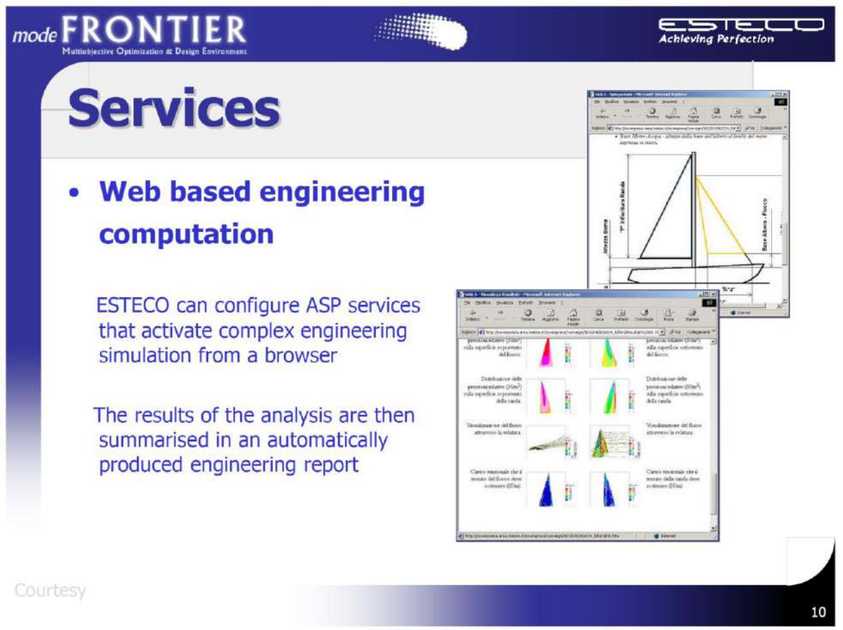


		BASELINE DESIGN	ULTRA LIGHT	%variation
power	kW	34,9	37,2	6,6
width	mm	75	70	-6,90
height	mm	330	325	-1,53
length	mm	550	420	-26,80
fin height	mm	2,5	3,5	33,33
weight	Kg	50	40	-22,22
volume	m^3	0,0136	0,00956	-35,03

- First shape optimization with Genetic Algorithm and Navier-Stokes solver (1993)
- Multiobjective optimization of airfoils (transonic/subsonic shapes) (1994)
- First engineering tool to adopt Java language for portability (1995)
- Adoption of Artificial Neural Networks for performance prediction (1998)

Industrialization





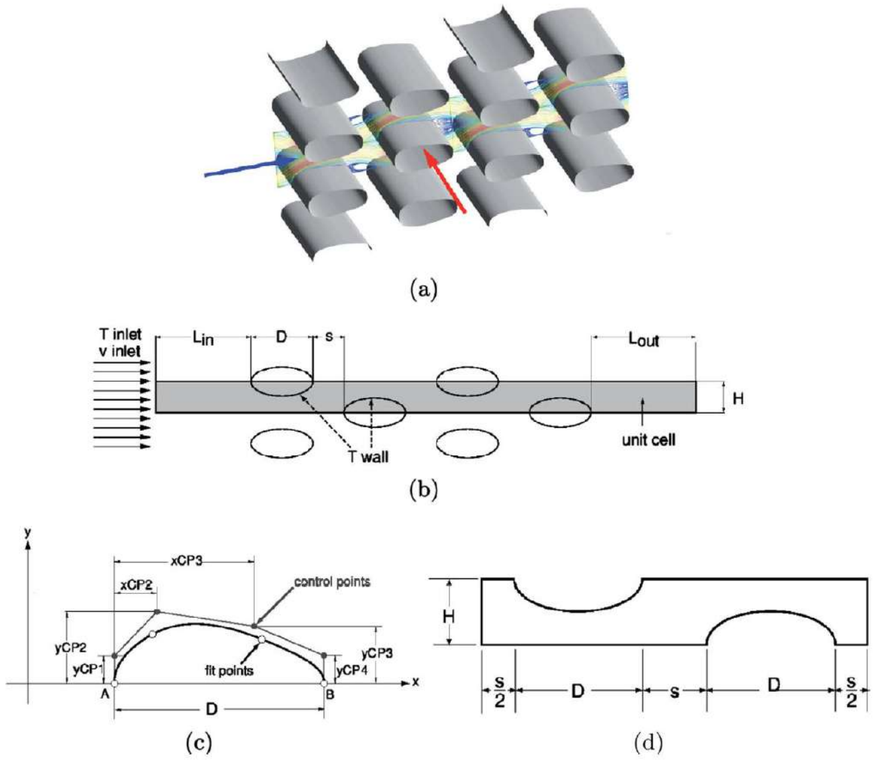
- Introduction of the Parallel Coordinate Chart for decision support in engineering design (1999)
- Self Organizing Maps to analyze high dimensional datasets (2006)
- Polynomial Chaos for uncertainty quantification (2008)

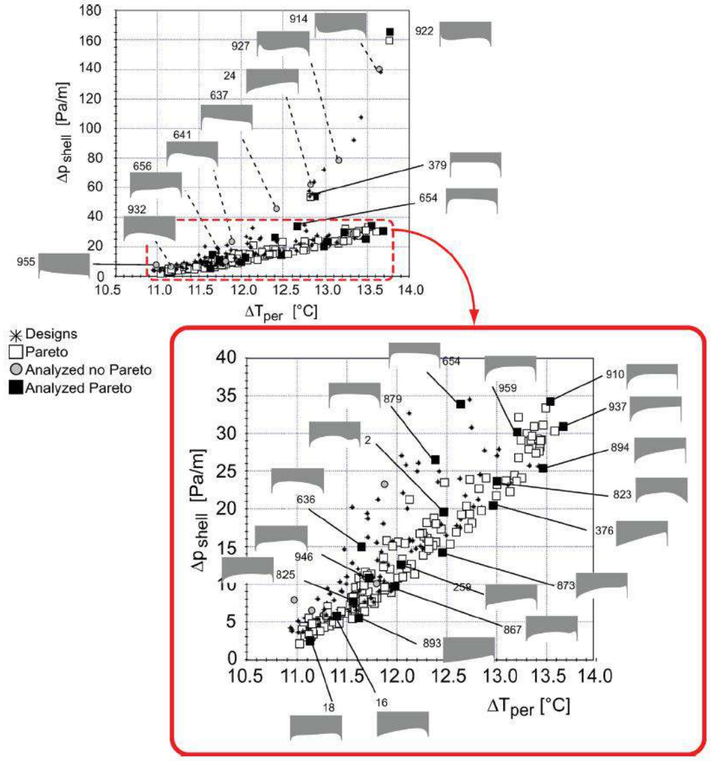
Refinement

Multi-objective shape optimization of a tube bundle in cross-flow

Paola Ranut [a,⇑], Gábor Janiga [b], Enrico Nobile [a], Dominique Thévenin [b]

International Journal of Heat and Mass Transfer 68 (2014) 585–598





- First to introduce MORDO and Reverse-MORDO (multi-objective robust design optimization) (2006 to 2008, 2006 with Montecarlo sampling, from 2008 with Polynomial Chaos)
- Service Oriented Architecture for distributed computing (SOMO which became VOLTA) (2010 started, commercial v1 in 2013)

Looking forward

- Adoption of the BPMN standard for process modeling and execution of engineering simulations (2020)
- First to adopt container architecture (2022)

Our people

our staff is our strength

140+

professionals

95%

with a university degree

17%

with a PhD

Our values

INNOVATIVE

Our development is at the forefront of technology

FLEXIBLE

We respond quickly to customers' demand

RELIABLE

Continuous development and on-time delivery

INDEPENDENT

We integrate with any software

We provide **modularity**, **standardization** and **interoperability** within the engineering design process.

ESTECO Technologies

Simulation Process and Data Management

Simulation Process Integration and Automation

Design Optimization

Business Process Management

HPC and Cloud

Robust Design and Reliability

Response Surface Models

Simulation Data Analytics

Our products

modeFRONTIER

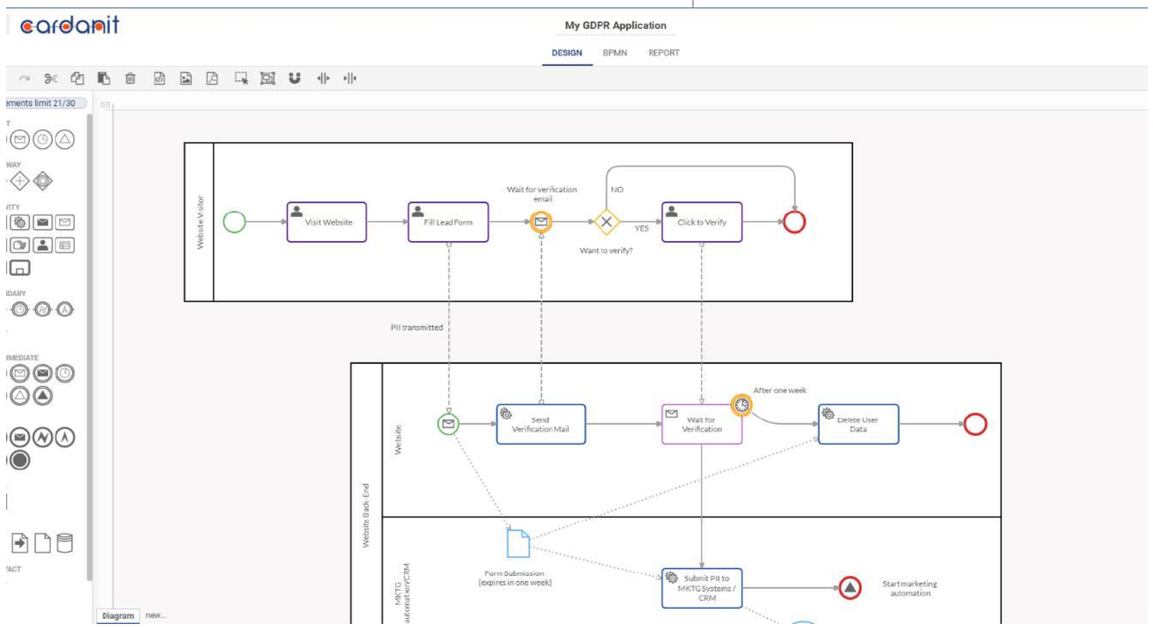
The leading software solution for simulation process automation and design optimization

VOLTA

The innovative enterprise platform for Simulation Process and Data Management (SPDM) and design optimization

Our SaaS application

Born as a research project, Cardanit is the next generation collaborative tool for designing business processes.



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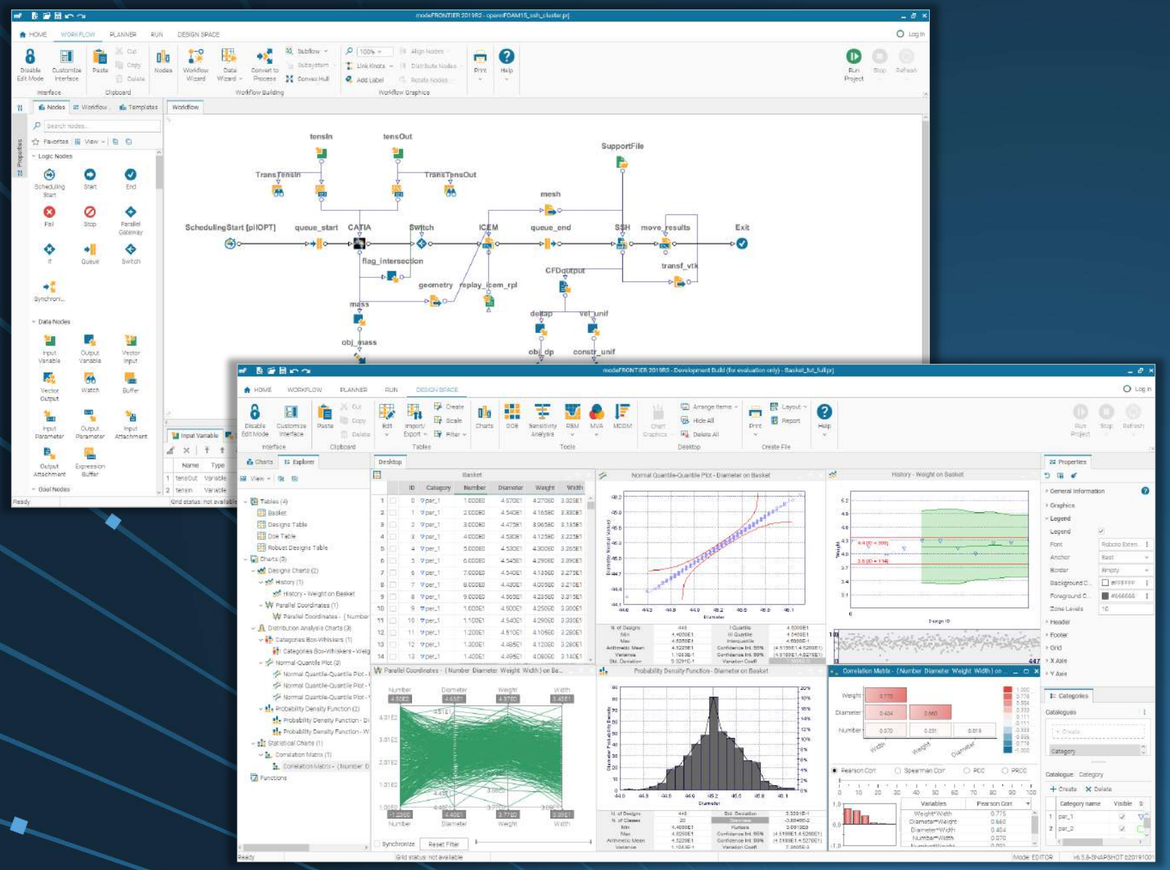
modeFRONTIER



Find the optimal design

Handle your design parameters and balance conflicting objectives.

Maximize IT resources

Exploit all computational resources and engineering solvers.

Deliver results on time

Accelerate the engineering process and run multiple simulations.

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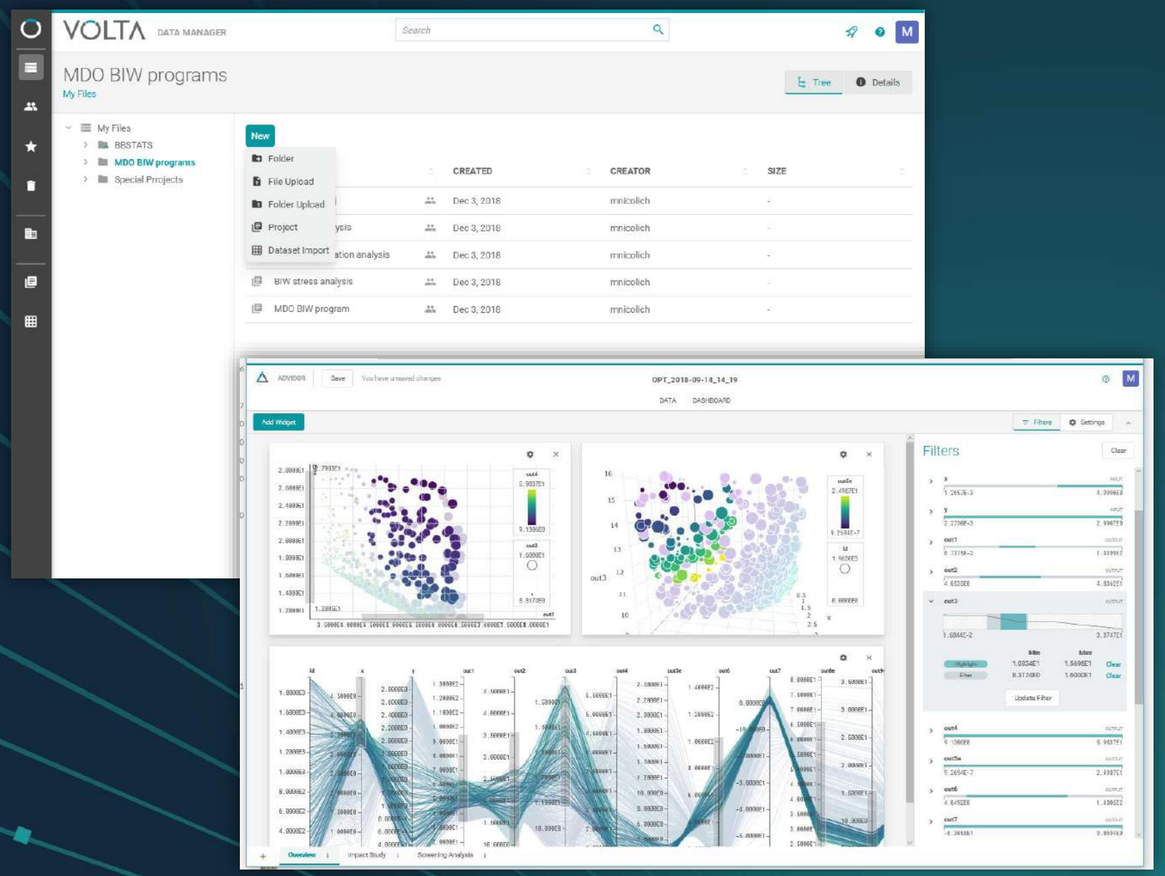
VOLTA



Make simulation data accessible

Expand the usage of engineering simulation across teams.

Reduce time-to-market

Fast deliver the best product by applying intelligent algorithms to the simulation process.

Lower costs

Maximize the investment in engineering solvers and IT resources.

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We facilitate engineering work, regardless of the level of expertise within one team, and our independent position ensures **fast responses to customer demands**.

Our customers and industries

Embraer
General Atomics
Leonardo
Lockheed Martin
Raytheon
Ford
Honda
Stellantis
Toyota
Volvo Cars Corporation

Mahindra
TAFE
Volvo Trucks
ABB
Bajaj
BASF
Cummins
FAW
Whirlpool
Sony

Automotive and Ground Transportation

Aerospace

Architecture, Engineering and Construction

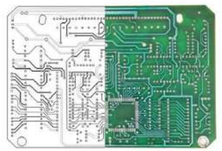
Manufacturing and Industrial Equipment

Marine

Energy

Healthcare

Consumer Goods



Electronics

Less intuitive applications / customers

Optimization of sport equipment dynamic response

Robust design / analysis of assets in the supply chain
(refrigeration systems, transit, storage, etc.)

Centre Public d'Action Sociale
de la Ville de Bruxelles

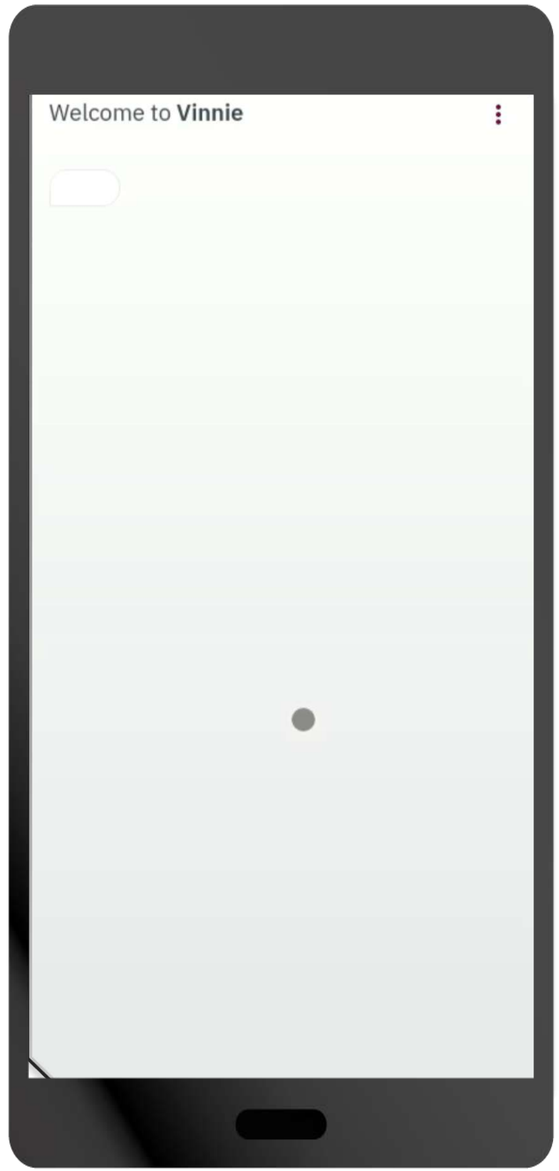
Social and Health services planning in Bruxelles City

Port Network Authority
of the Eastern Adriatic Sea
Ports of Trieste and Monfalcone

Port multi-modal transportation modelling and optimization

Our adventures

- Machine Learning
- Social login
- Progressive web apps
- Cloud

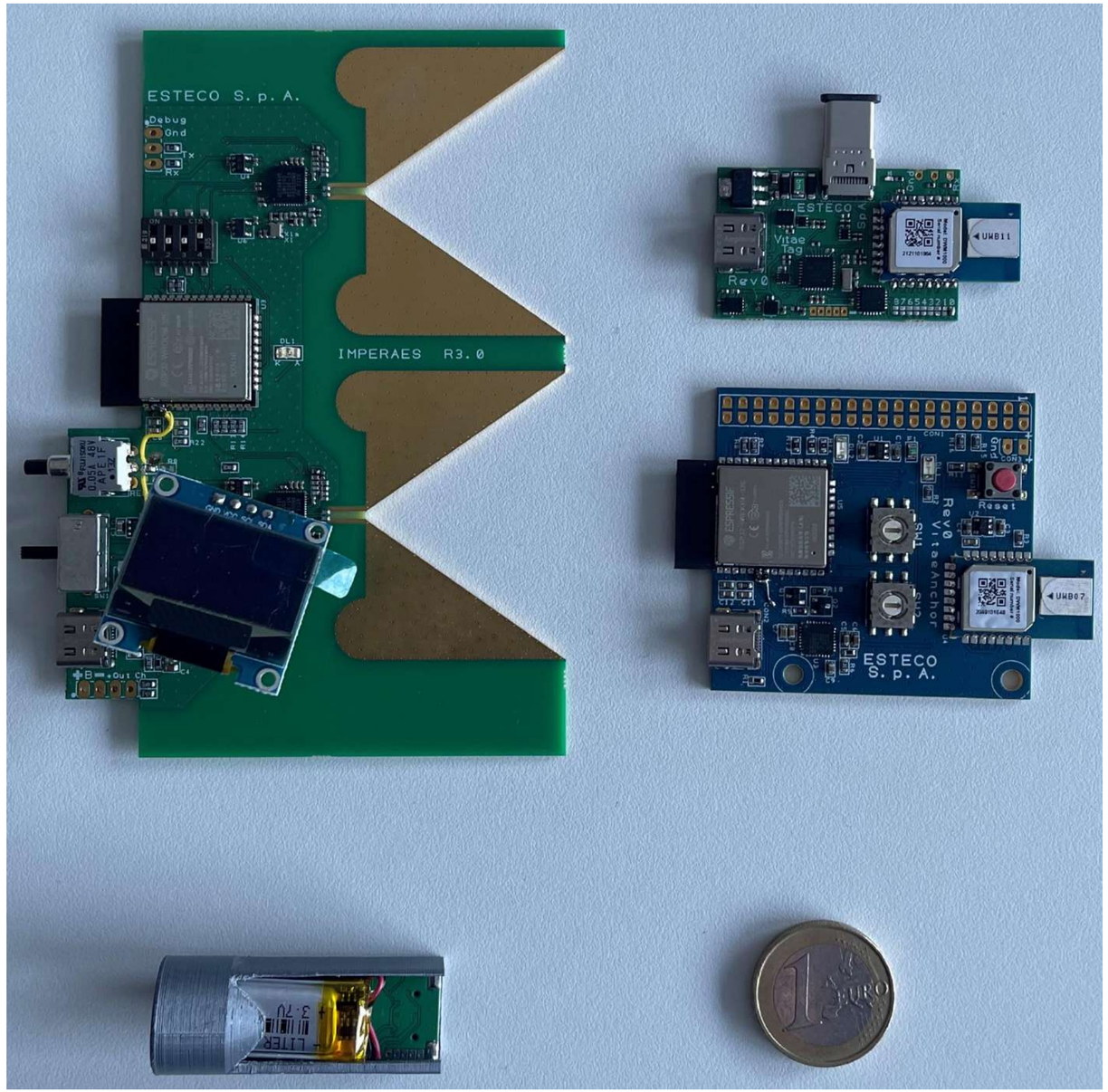


Our adventures

HW prototypes

(es. Indoor localization, UWB based, proprietary algorithms and hardware)

- IoT
- Machine Learning

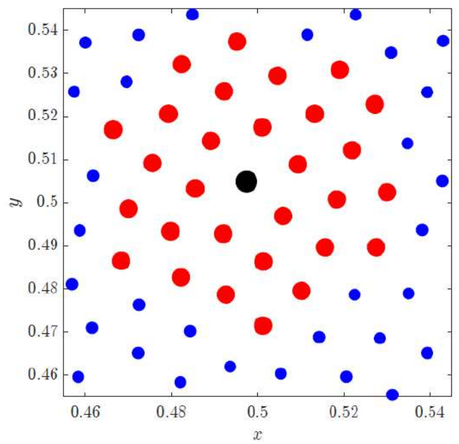


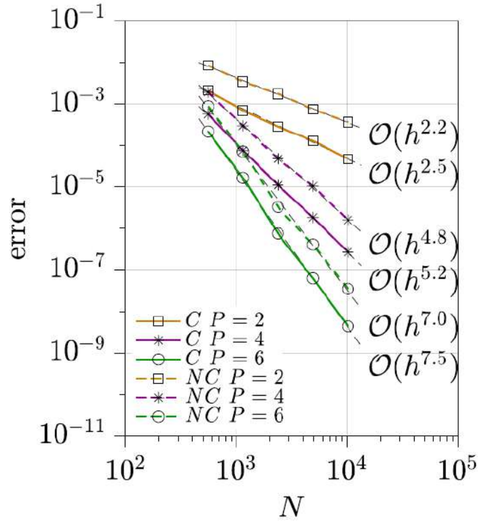
Our adventures

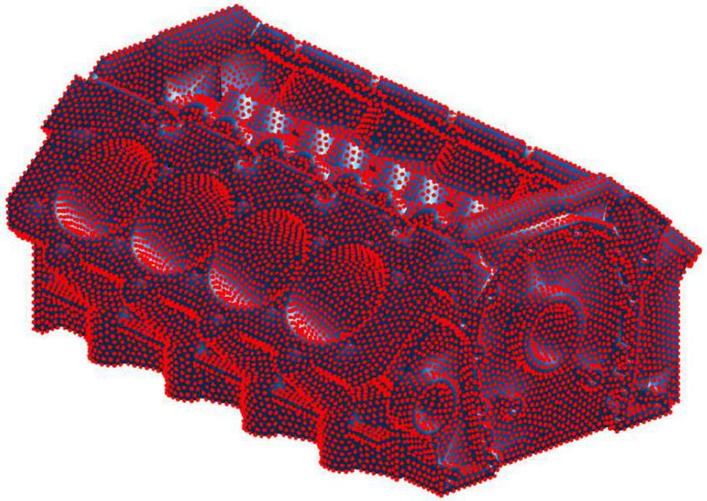
Meshless RBF-FD

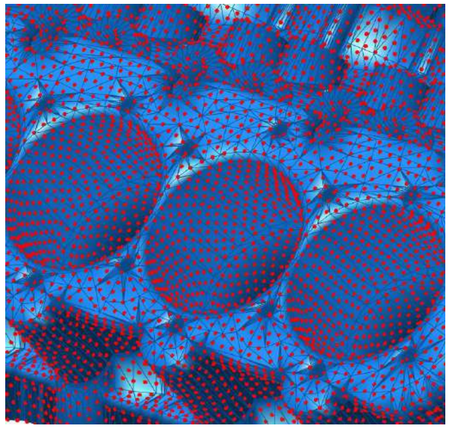
(Radial Basis Function Finite Difference)

- Direct solution of fluid flow and heat transfer problems
- Physics-Informed Neural Networks (PINNs)

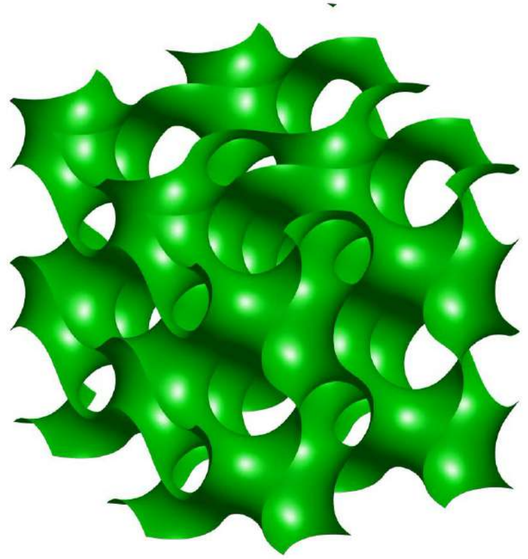








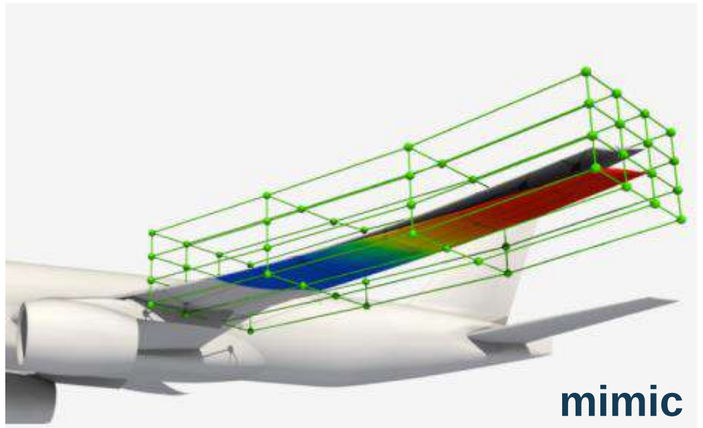
Gyroid

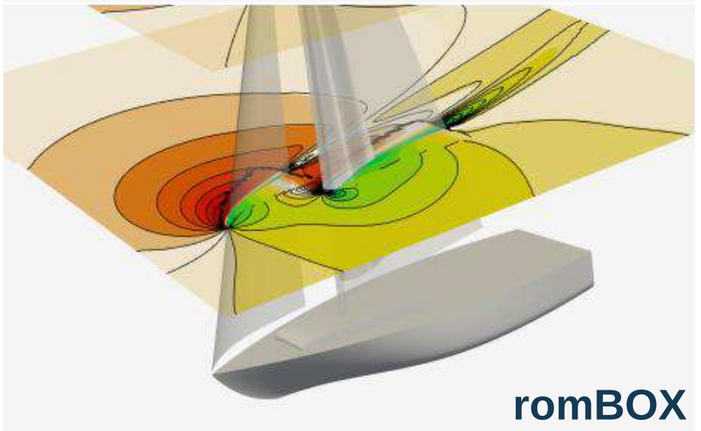


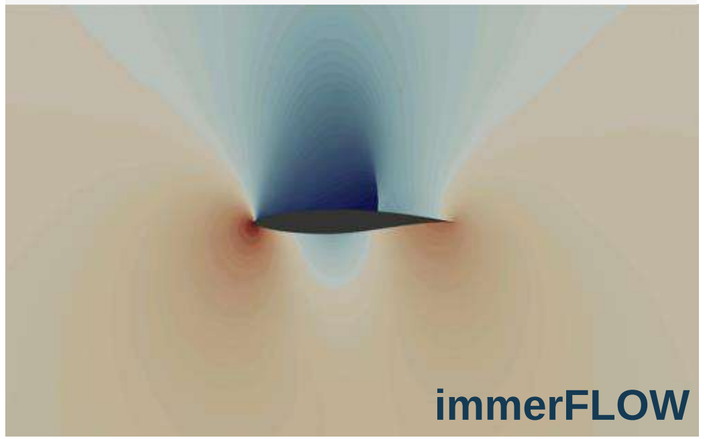
Our adventures

OPTIMAD
numerical creativity

- Geometry morphing
- Reduced Order Models
- Immerse Boundary CFD







Our Global presence

Thank you!

esteco.com

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