Tool Integration and Software as a Service

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Overview

Context: HOLISHIP

Hydrodynamic Tools

Example: ν-Shallo

- Introduction
- WebApp

Software as a Service

Conclusions & Outlook

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Context

- EU-funded project HOLISHIP (Holistic Optimisation of Ship Design and Operation for Life Cycle)
- Started in September 2016
- 38 partner organisations
- www.holiship.eu

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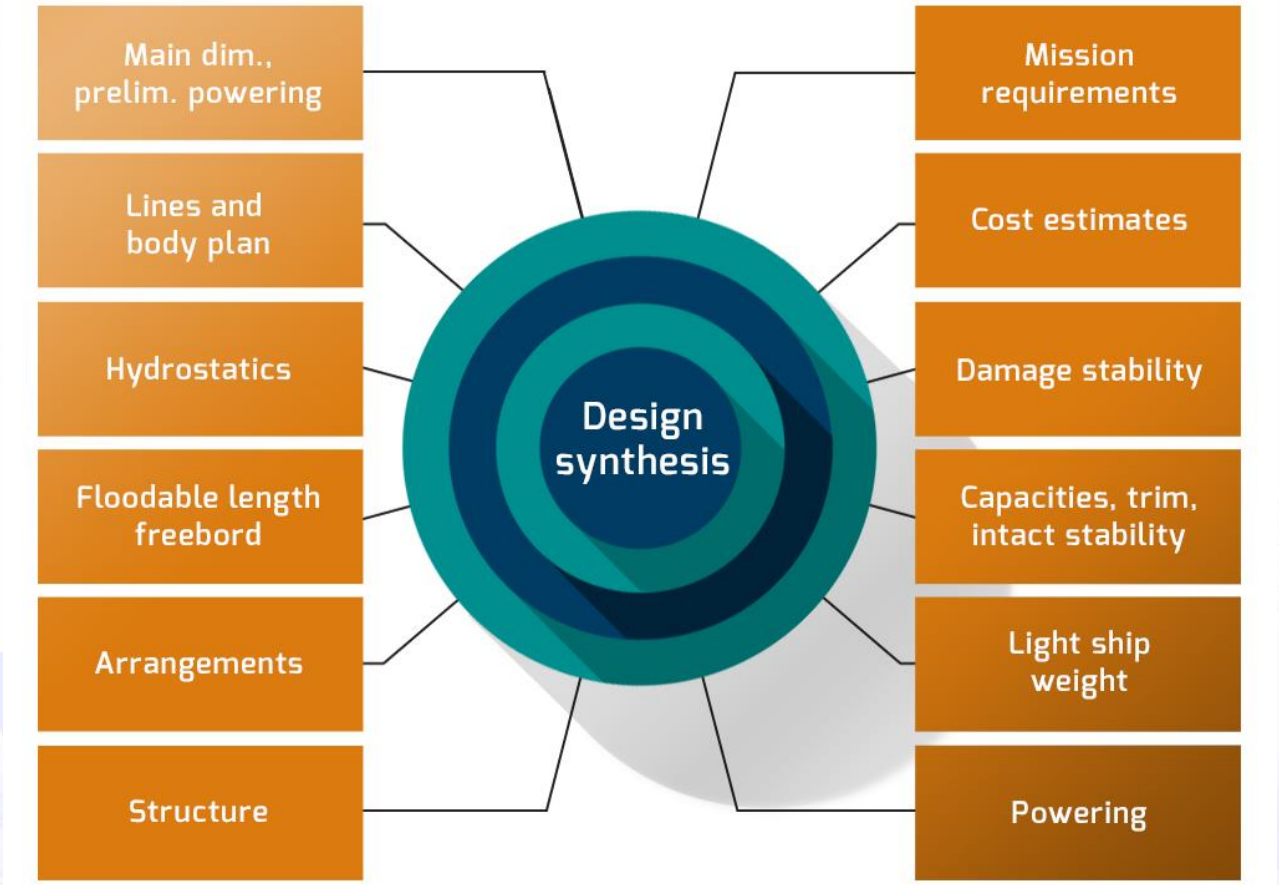
HOLISHIP Approach



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HOLISHIP Approach

- Many design tools from different disciplines
- Two platforms
  - Design: CAESES
  - Virtual Vessel Framework
- Tool suppliers will integrate their tools with support of platform providers
  - Advantage: integration can easily be updated (most tools under active development)
- Tool integrations will be demonstrated in a number of application cases

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Hydrodynamic / Hydrostatic Tools

			index	Software Tool	Description	Partner
Hydrodynamic Analysis Tools	RANS & URANS codes		1	StarCCM+	RANS code for calculating resistance, seakeeping and maneuvering	Tritec Marine
			2	FreSCo+	RANSE Based CFD code for viscous flow simulations. Used to determine hull resistance and propulsion properties, behavior of ships in a seaway (ship motions and added resistance), maneuvering capabilities etc.	HSVA
			3	ReFresco	RANS code for calculating ship resistance, flow around the hull and for determining maneuvering characteristics.	MARIN
			4	Xnavis	Steady/Unsteady RANS based solver	CNR-INSEAN
	Potential Flow Codes	Seakeeping	5	ANSYS AQWA	Potential theory based BEM solver for seakeeping calculations	Tritec Marine
			6	NEWDRIFT	Potential flow 3D panel code for seakeeping, motions, loads and drift forces on ships and floating bodies in waves	NTUA
			7	ShipX - Vessel Responses (VERES)	Potential, strip theory based tool. Calculates ship motions and global loads, including short term statistics, long term statistics and operability.	SINTEF
			8	Aegir	Potential flow 3D Panel code (nonlinear/unsteady, time domain): seakeeping, added resistance, unsteady loads, 6DOF	CNR-INSEAN
			9	HydroStar	Sea-keeping software based on Boundary Element Method (BEM), using linear and 2nd order potential theory.	BV
		Wave Resistance	10	v-SHALLO	Fully non-linear, free surface potential CFD code computing the inviscid flow around a ship hull at a free surface	HSVA
			11	WARP	Potential flow 3D Panel code to determine calm water resistance and loads. Steady, 2DOF	CNR-INSEAN

Table 1: List of Software Tools – Potential Flow & RANS

		index	Software Tool	Description	Partner
Hydrodynamic Analysis Tools	Other Tools for Hydro Analysis	12	MaxWave_Prop	Estimates the maximum wave height at which the ship is capable to navigate in head waves	Strathclyde
		13	MaxWave_Steer	Predicts the maximum wave head and the maximum available speed at which the ship is capable to maneuver in adverse sea conditions	Strathclyde
		14	Parametric Rolling	Tool developed within CAESES. Performs level 1 and level 2 checks for parametric roll failure mode, as described in SDC 2/WP.4 IMO guidelines	Strathclyde
		15	ShipX - Ship Speed and Powering	Calculation of calm water resistance and performance in addition to speed loss in waves. Utilizes empirical methods , residual resistance from database or model test or regression of resistance from SINTEF Ocean's database	SINTEF
		16	Wageningen B-series	Estimates the thrust and torque propeller characteristics using Wageningen B-series data (Matlab code)	Strathclyde
		17	Holtrop and Mennen's method	Utilizes empirical methods for resistance and propulsion prediction	Strathclyde
		18	XShip	XShip is an empirical maneuvering simulation tool.	MARIN
	CASD Tools	19	NAPA	Naval Architecture Package suitable amongst others for stability calculation (intact and damage)	HSB
		20	NAPA macros	NAPA macros for intact and damaged stability calculations	NTUA
	Supplementary Tools	21	HEXPRESS	Hexahedral volume mesh generation tool	HSVA
		22	CAESES Connector tool for StarCCM+	CAESES Connector tool for StarCCM+	Strathclyde

Table 2: List of Software Tools – Other Tools

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Table 2: List of Software Tools – Other Tools

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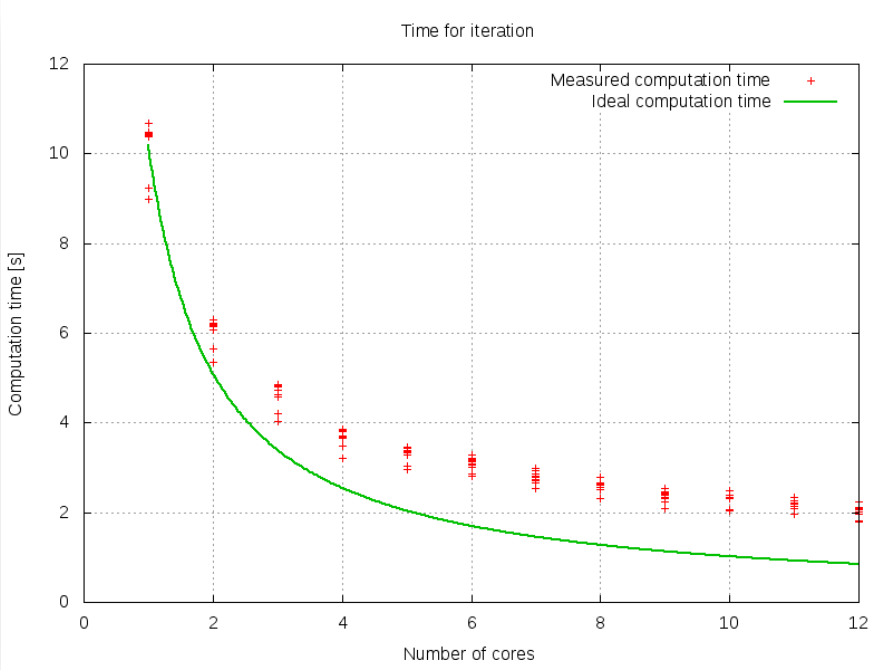
ν-Shallo: Introduction

- Calm water resistance based on potential flow
- Nonlinear BC at water surface, requires iterative solution
- Resistance by pressure integration
- Shared-memory parallelisation (OpenMP)



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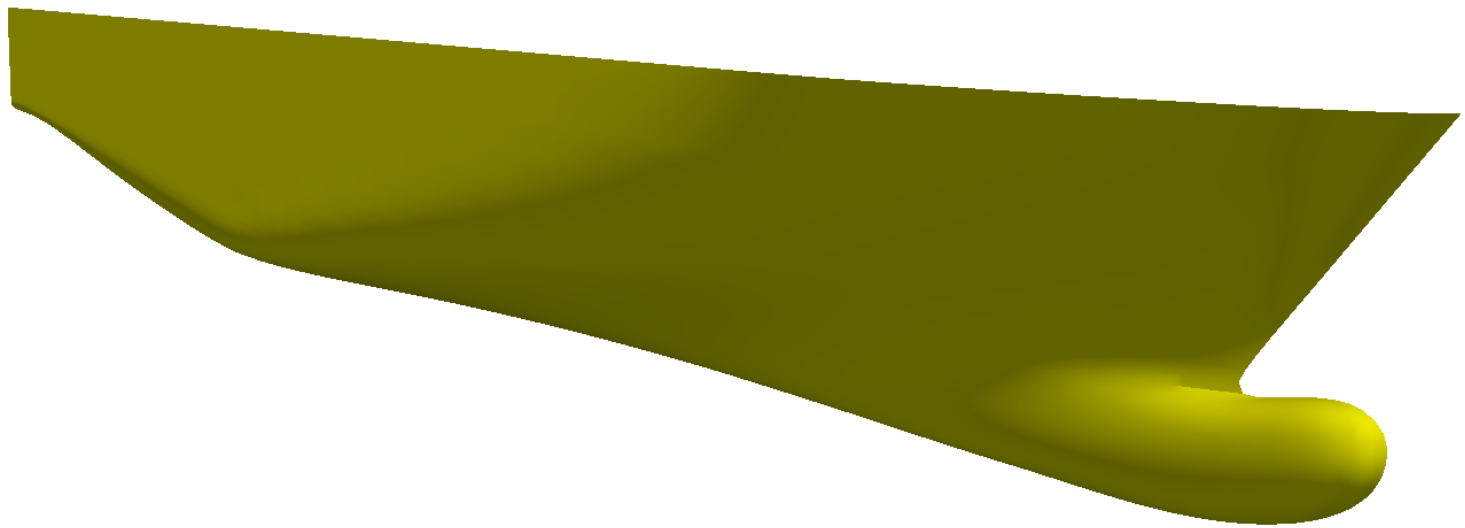

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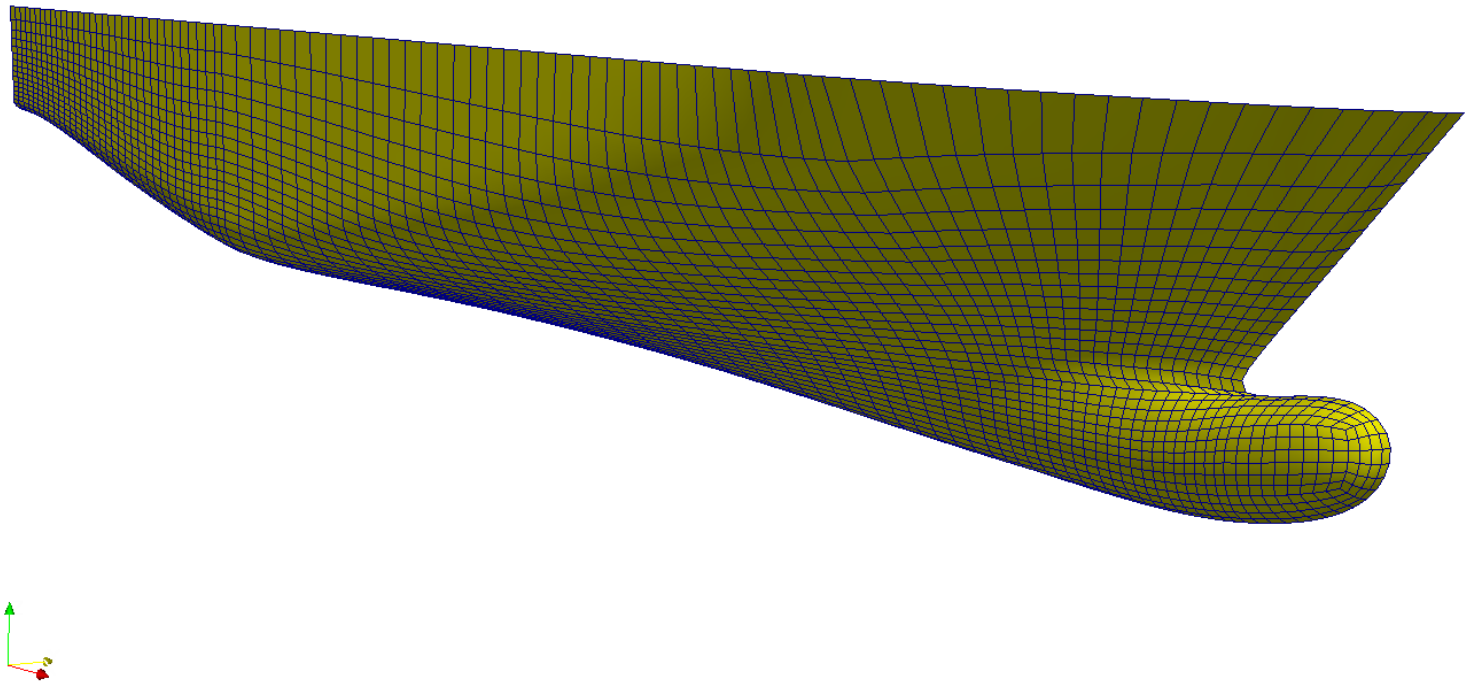

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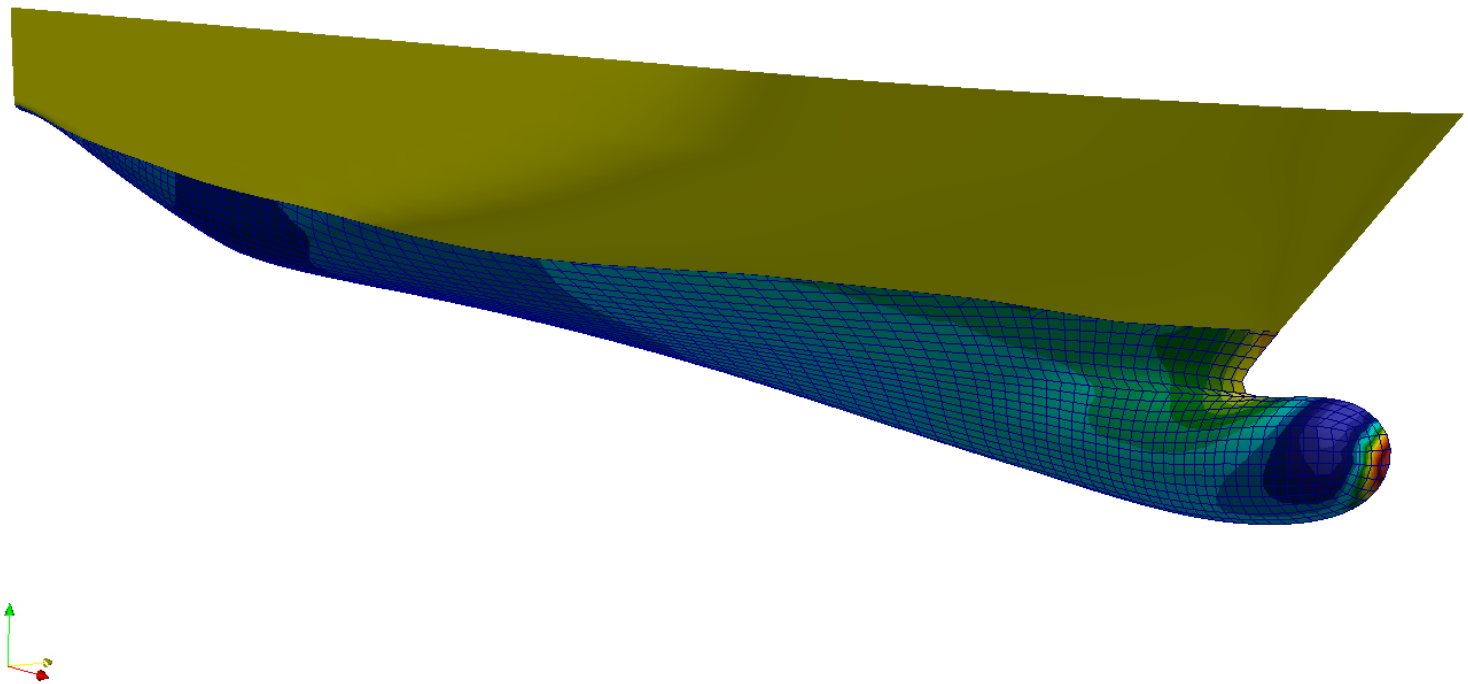

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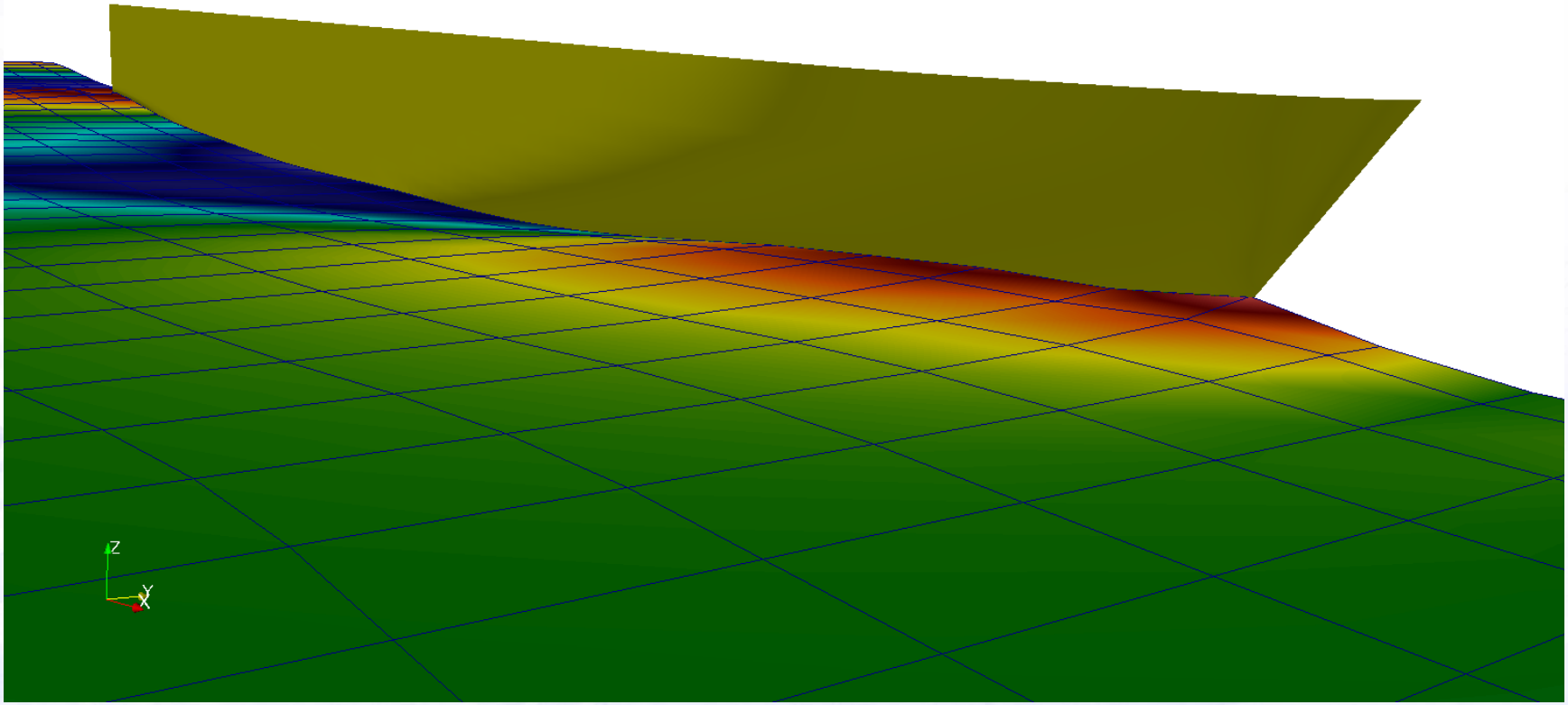

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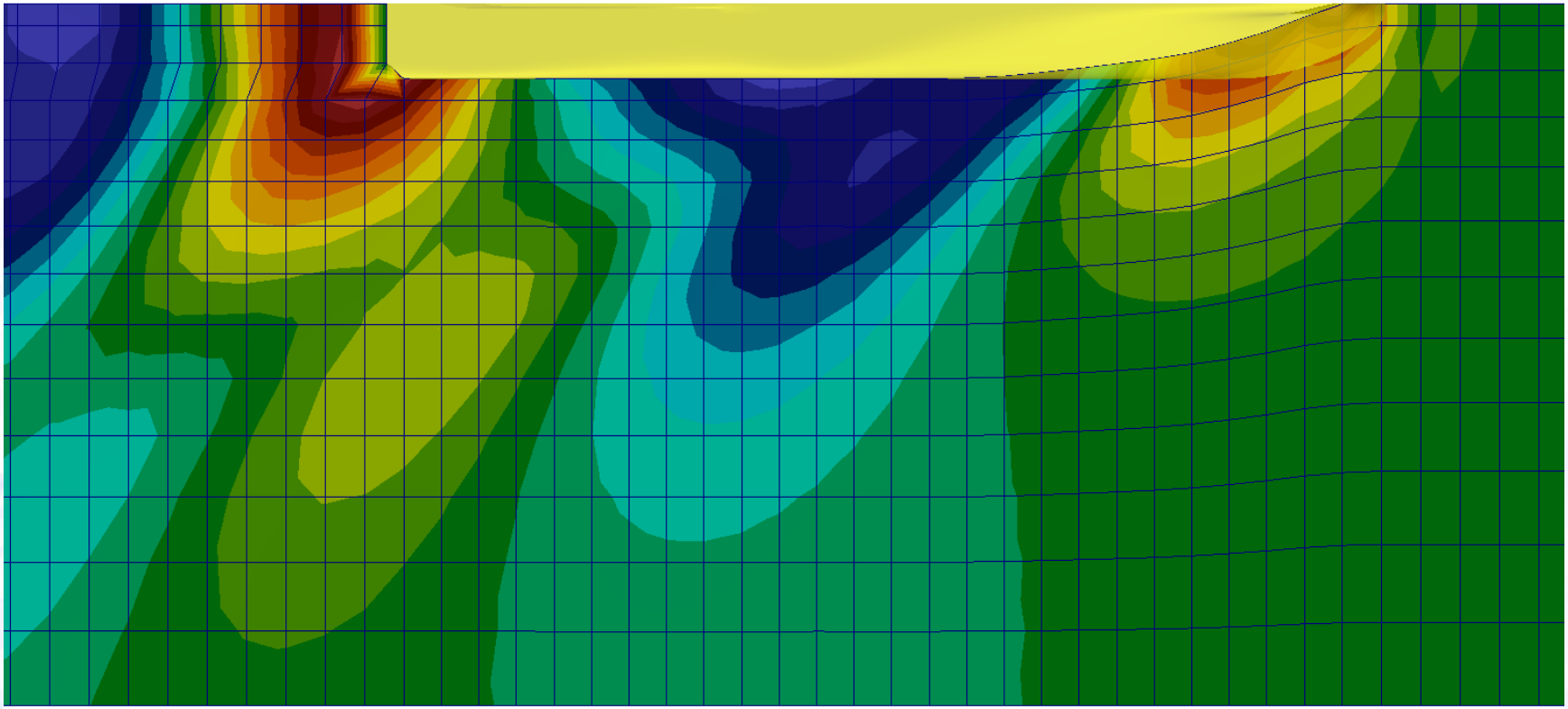

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ν-Shallo: Integration

- Input
  - Representation of geometry: panelisation
  - Two ASCII files for case setup
- Output
  - ASCII files reporting resistance, trim and sinkage
  - VTK files
    - Wave elevation
    - Pressure distribution / velocities on the hull

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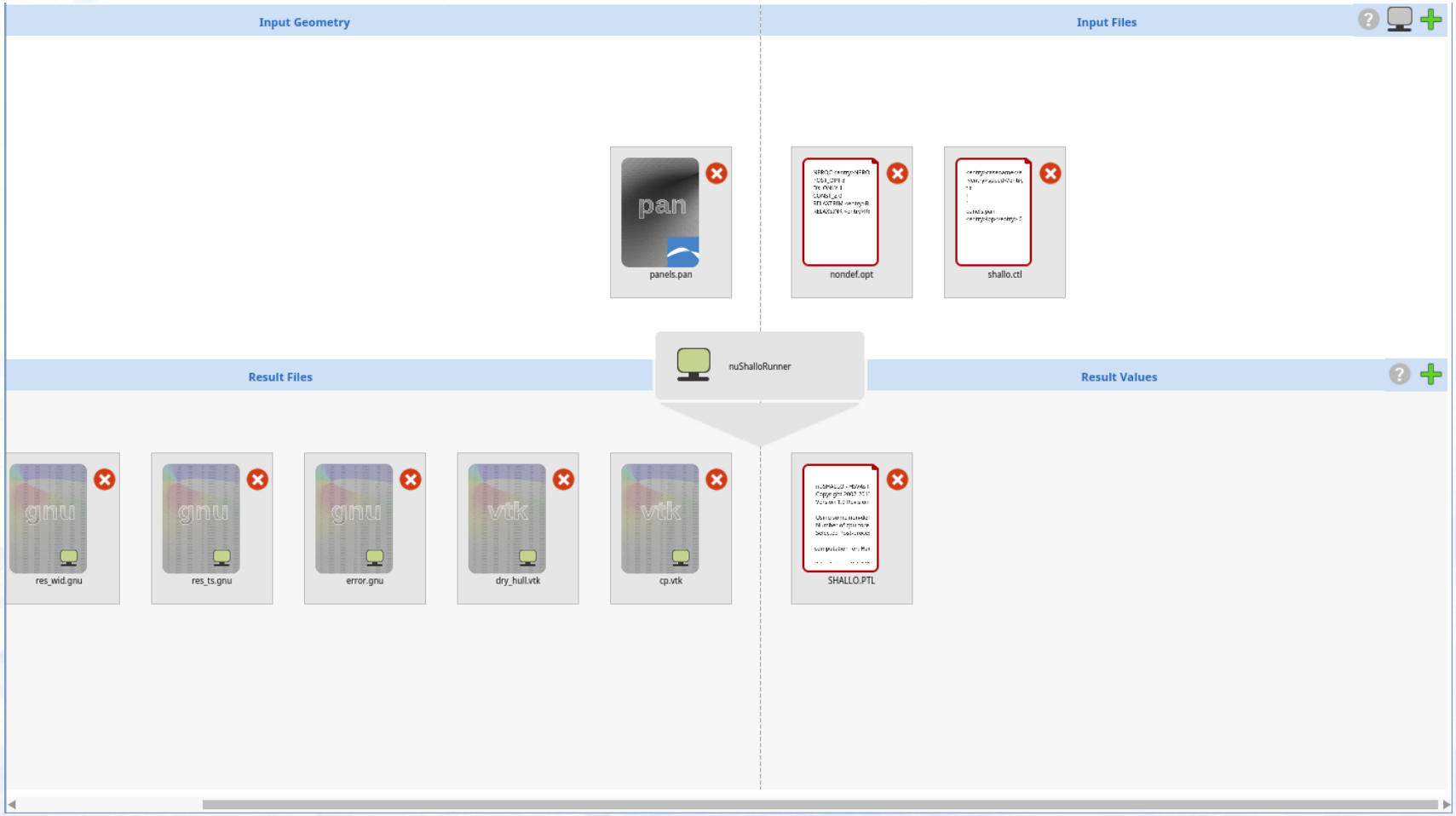
ν-Shallo: Integration



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ν-Shallo: Integration

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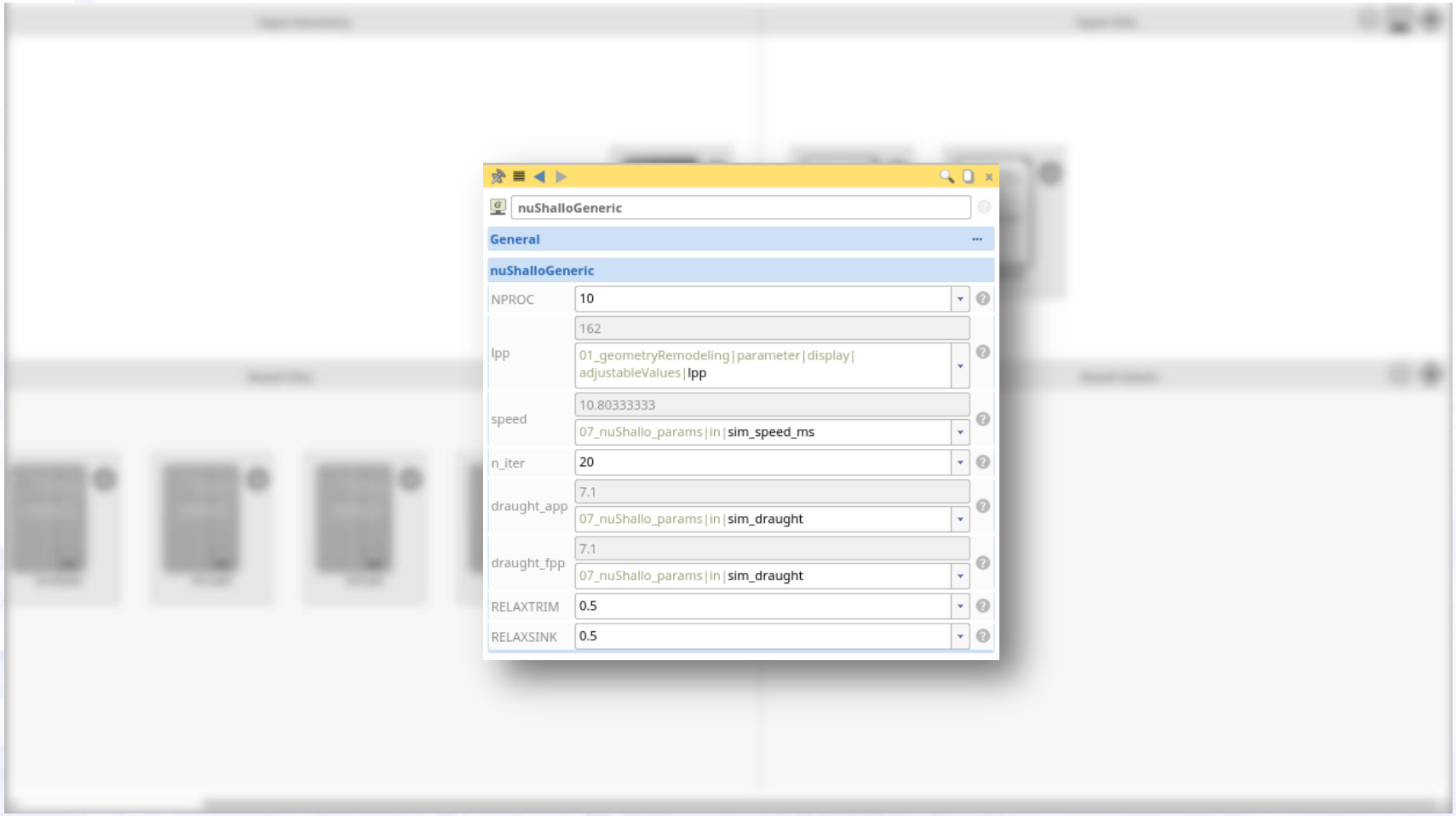

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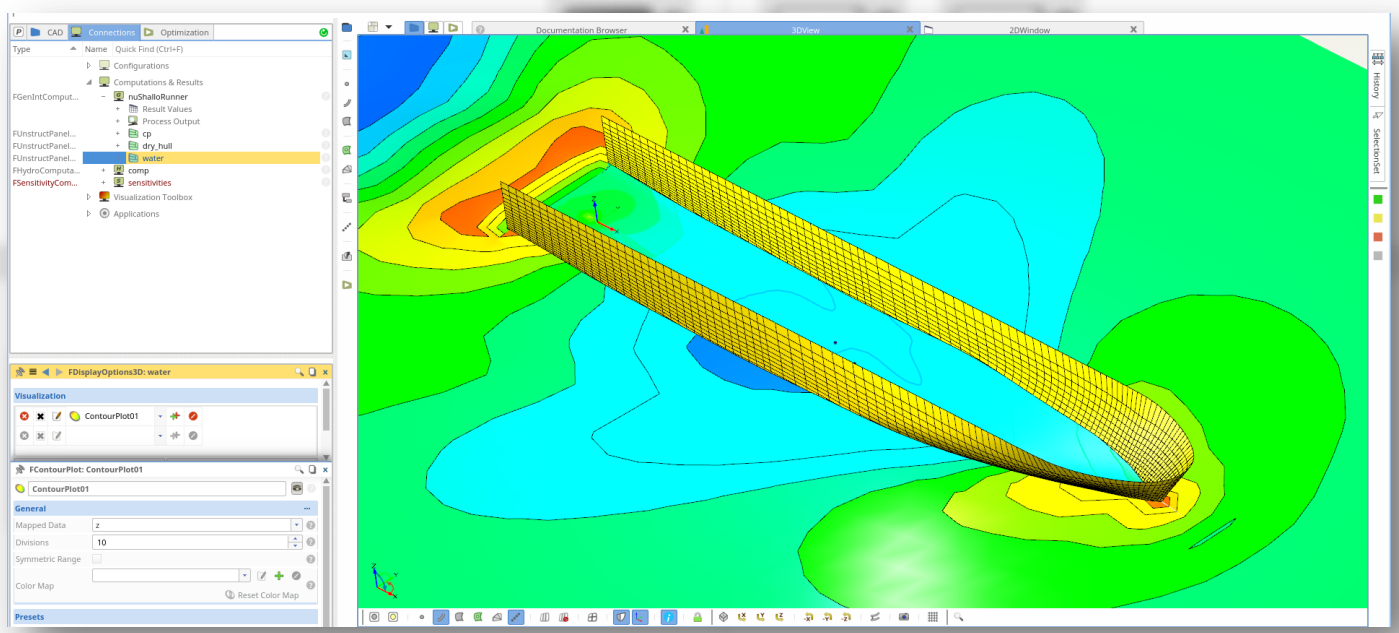

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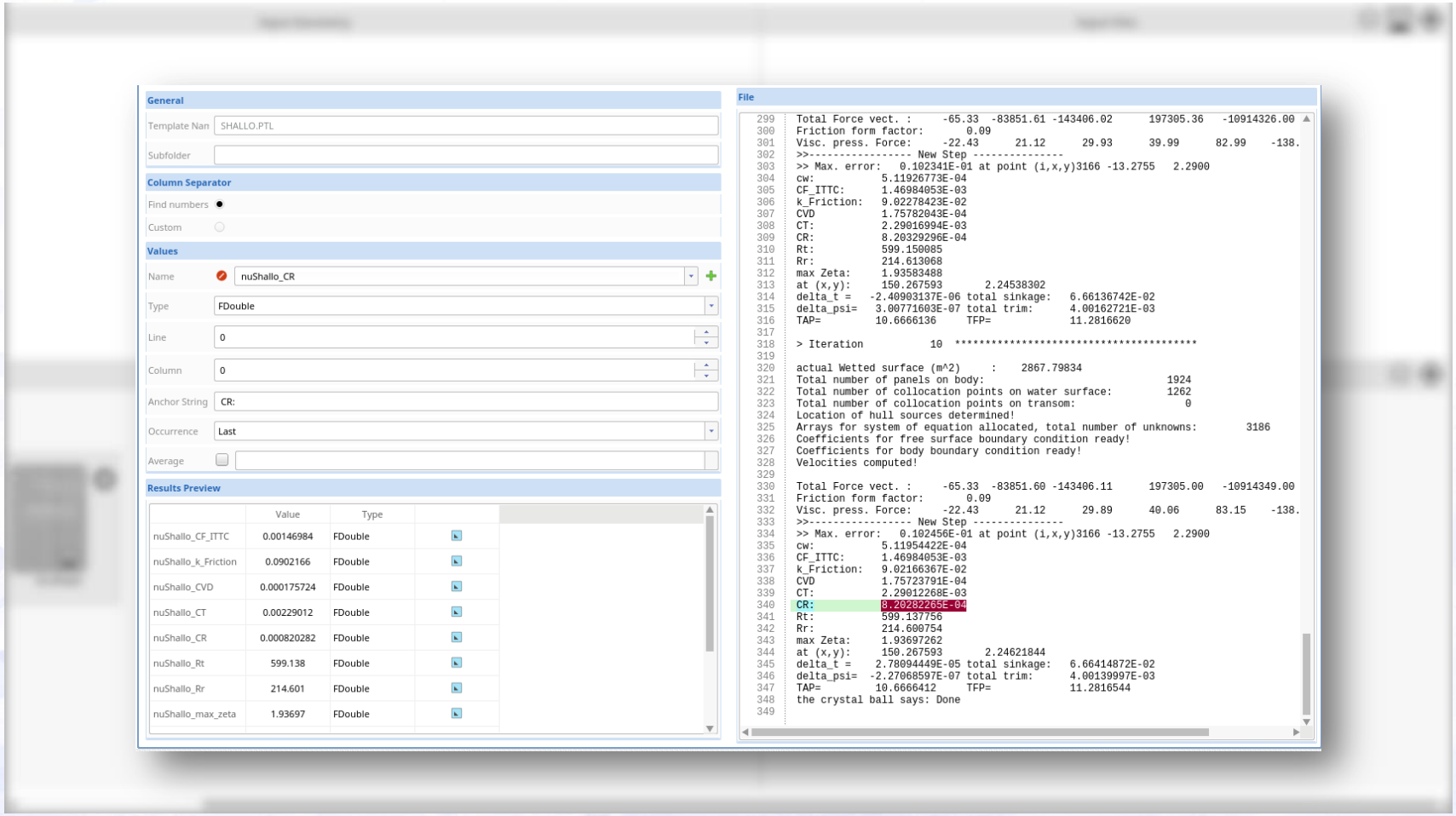

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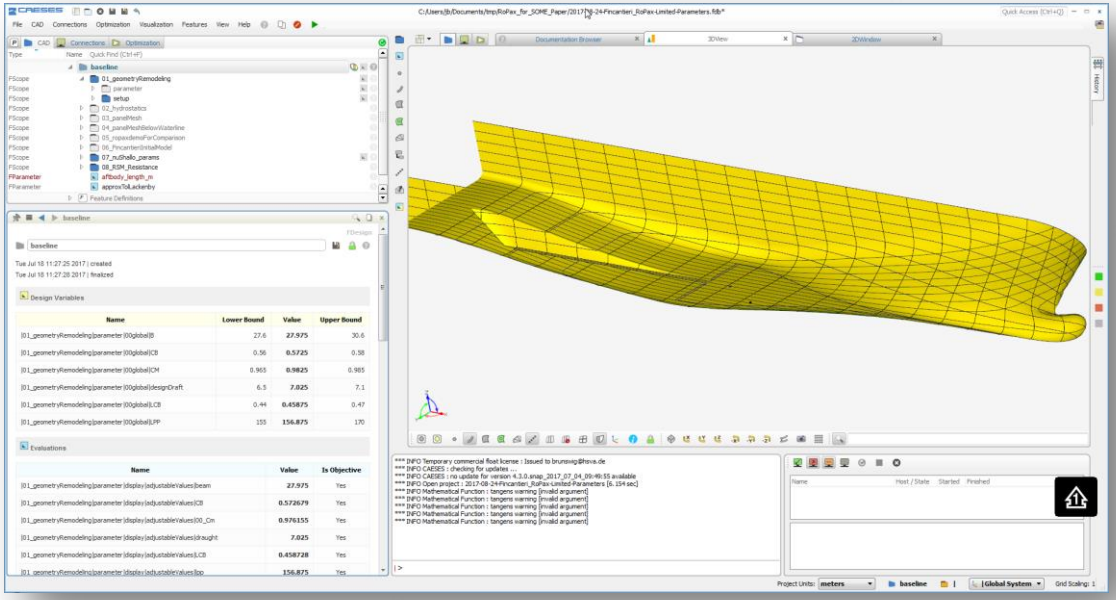
RoPax WebApp: Model



- Based on a Fincantieri design
- Re-modelled using CAESES
- Most parameters are relative (factors)

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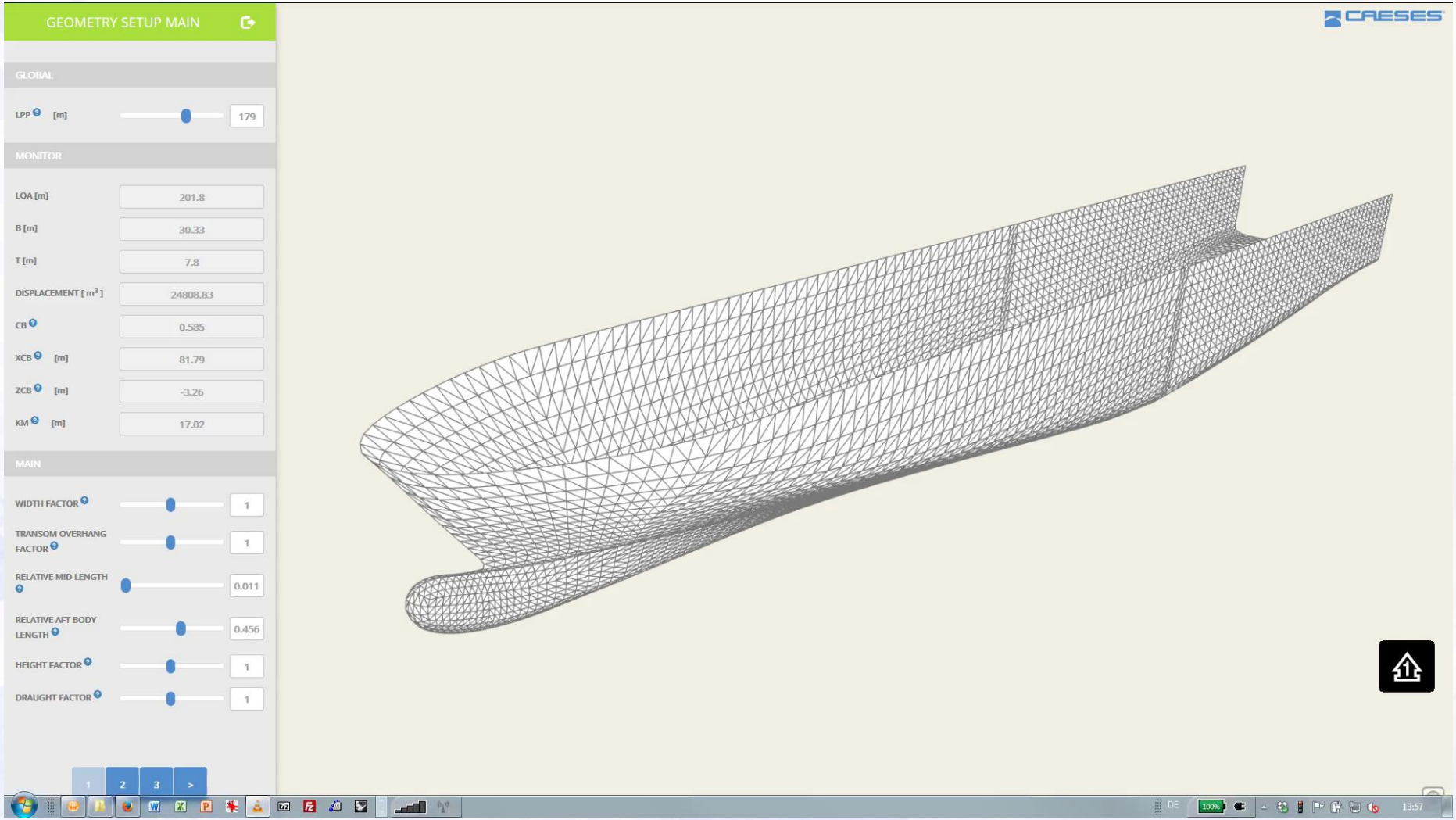
RoPax WebApp: Demo



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Benefits of Web Apps

- Provider:
  - Wrap complex functionality in simple interface
  - Demonstrate functionality of a tool or model
  - **Offer services efficiently (e.g. as pay-per-use)**
- User:
  - No software licenses required
  - No specialists required for standard simulations
- Customer:
  - More cost-efficient for low-volume applications

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Software as a Service (SaaS)

- CFD Simulation(s)
  - Calm water resistance
  - Speed-power (incl. propulsion)
  - Seakeeping
  - Adjoint Analysis
- Optimisation
  - Single discipline, e.g. hydrodynamics
  - Multiple disciplines

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SaaS: Challenges

Things that could go wrong

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SaaS: Challenges

Things that could go wrong

User input: geometry provided by customer not valid

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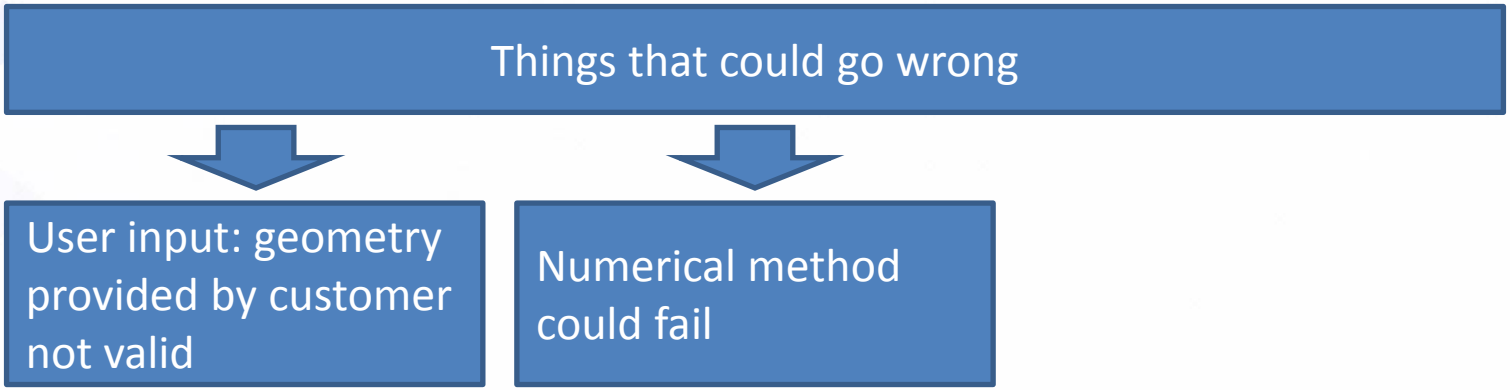
SaaS: Challenges



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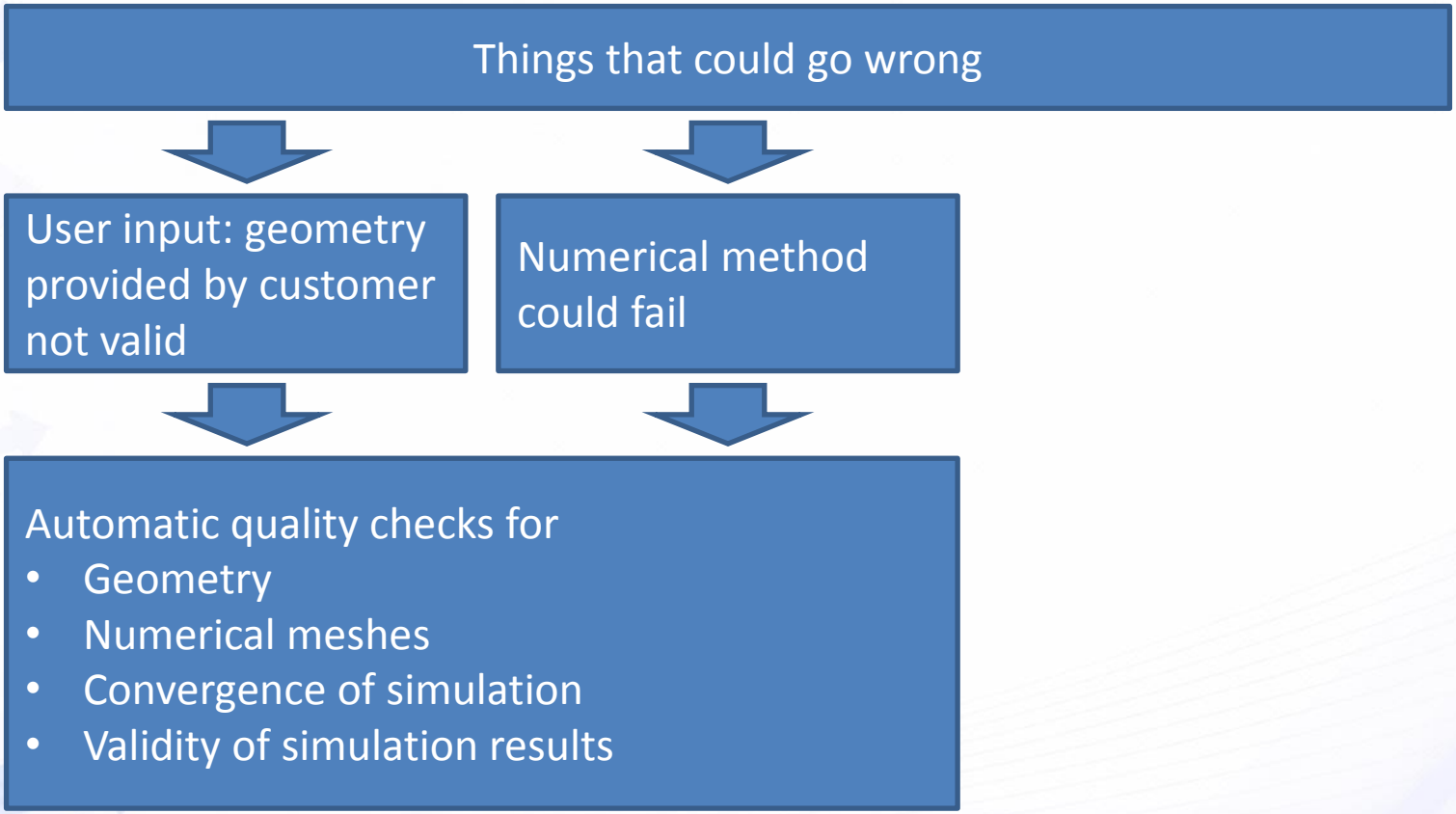
SaaS: Challenges



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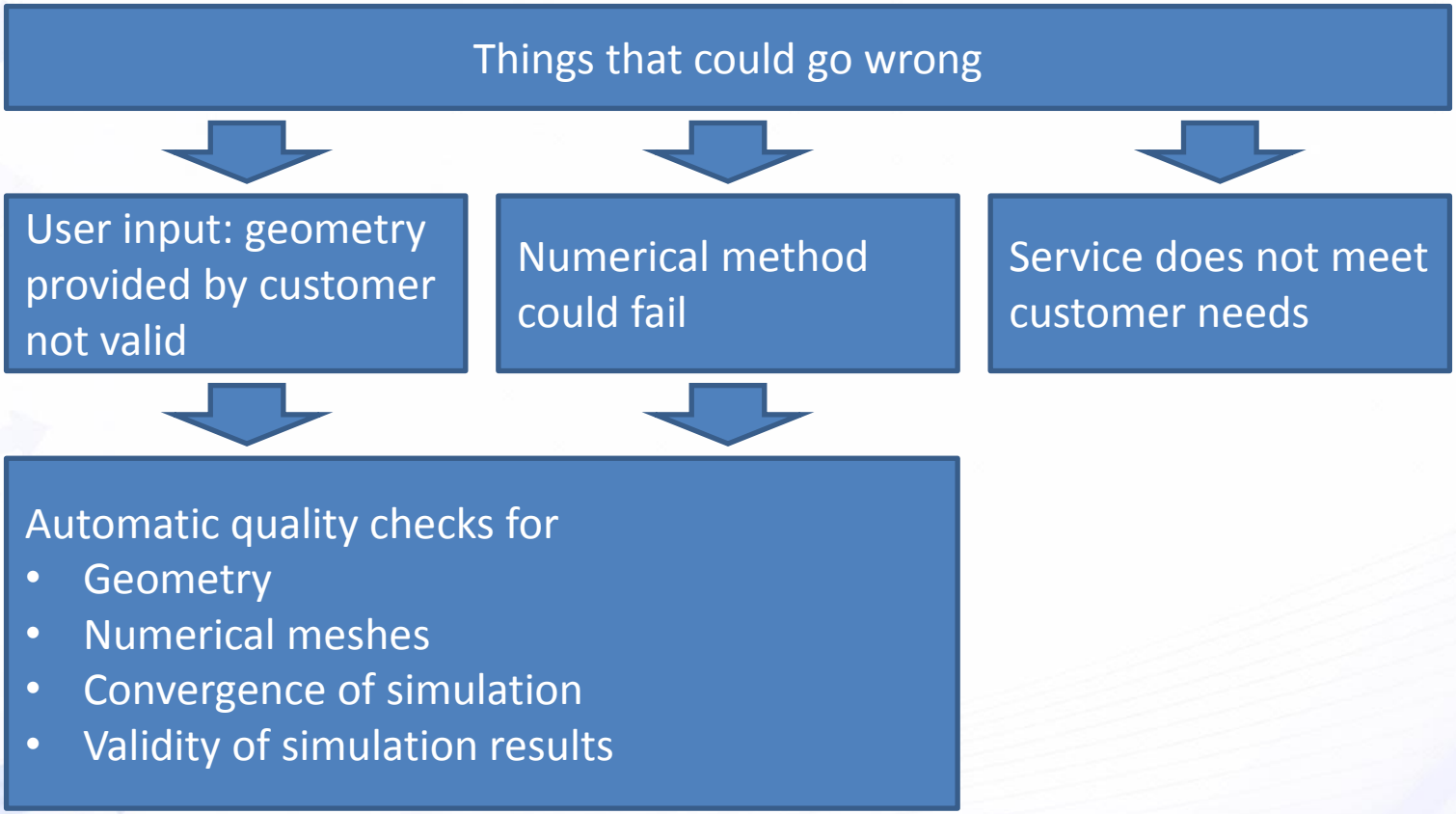

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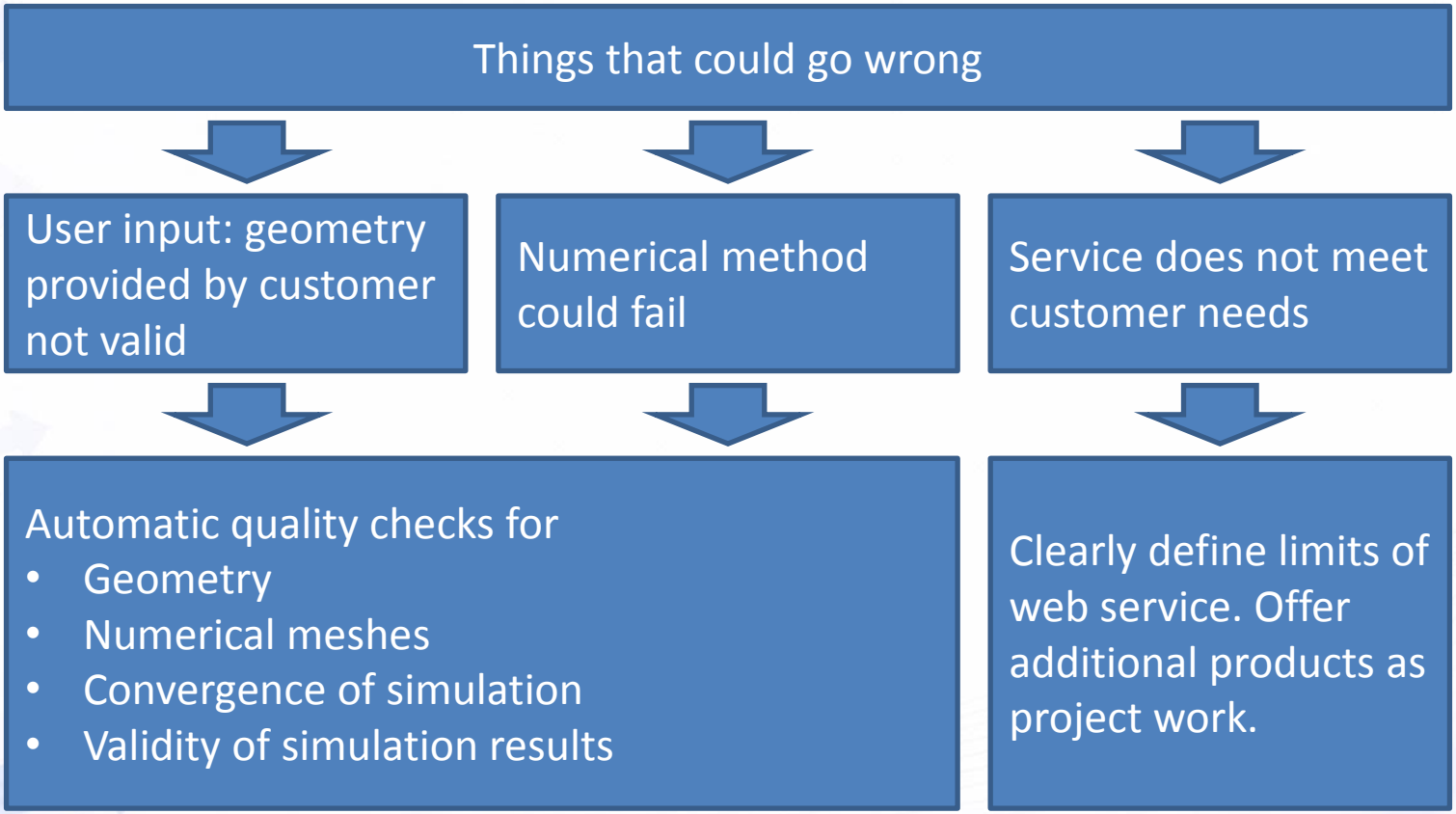

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SaaS: Open Questions

- Are there serious legal issues?
- Who would do user management and shop setup?
- Could web services cannibalize classical project work?

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Conclusions & Outlook

- ν-Shallo WebApp works as a demonstrator
- Integrated tools could be implemented as SaaS
- Next steps:
  - Work on process chains for viscous CFD applications
  - Develop and implement validity and quality checks
  - Integrate more tools
  - Further assessment of SaaS

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Thank you for your attention!

Questions? Suggestions? Remarks?

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