

OCTOBER 26, 2023

Structural modelling with AVEVA™ E3D Design for design collaboration and FEM

Juha Peippo, Rauma Marine Constructions

Jussi Puurula, Rapid Structural Design

Henri Särkkä, AVEVA

AVEVA

Introduction: Henri Särkkä

Principal Presales Consultant at AVEVA

- Located in Vantaa, Finland
- 6 years of experience in marine design software
- Experience from multiple major shipyards across North America, Europe, and Asia



Introduction: Jussi Puurula

Founder of Rapid Structural Design

- Located in Jyväskylä, Finland
- 15 years of ship structural design, modelling and analysis
- Various highly complex ship projects, from icebreakers to the world's largest cruise vessels
- Hands-on, team lead, consultancy, and development



Introduction: Juha Peippo

Strength analysis coordinator and developer at Rauma Marine Constructions

- Educational background, D.Sc (Tech.)
- Located in Rauma, Finland
- 25 years of experience in strength analysis coordination
- Cross-industry development experience
 - Transformation from 2D drawings to 3D design
 - PLM-based FE analysis



Introduction: Rauma Marine Constructions

Experts in building challenging special ships

- Located in Rauma, Finland
- Design, construction and maintenance of
 - Car and passenger ferries
 - Icebreakers
 - Navy and other government authority vessels



1 billion EUR orderbook	6 ships to be built	200+ shipbuilding experts	2014 founded in	20+ partners in network	100 % Finnish ownership
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The logo for Rauma Marine Constructions, featuring a stylized white compass rose or ship's hull shape within a blue diamond. The text 'RAUMA MARINE CONSTRUCTIONS' is written in white, bold, sans-serif capital letters across the diamond.

RAUMA MARINE
CONSTRUCTIONS

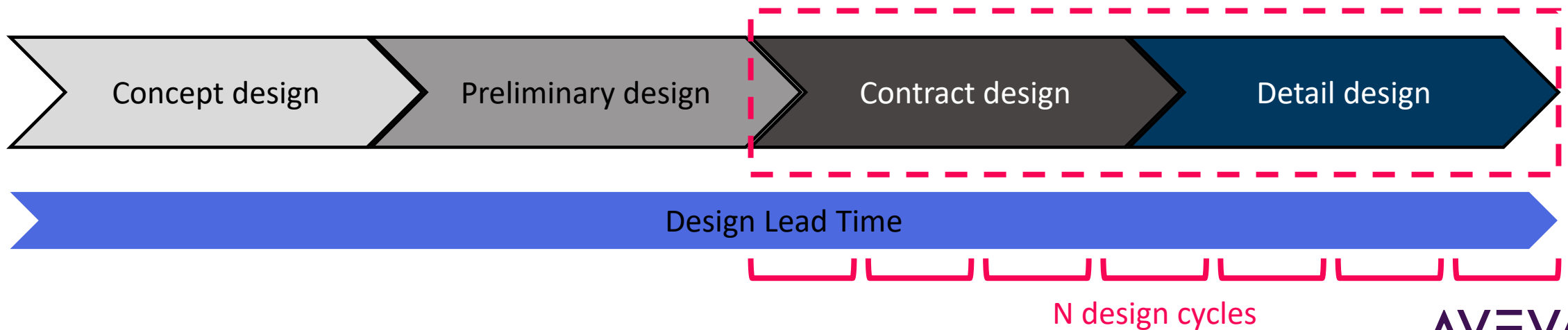
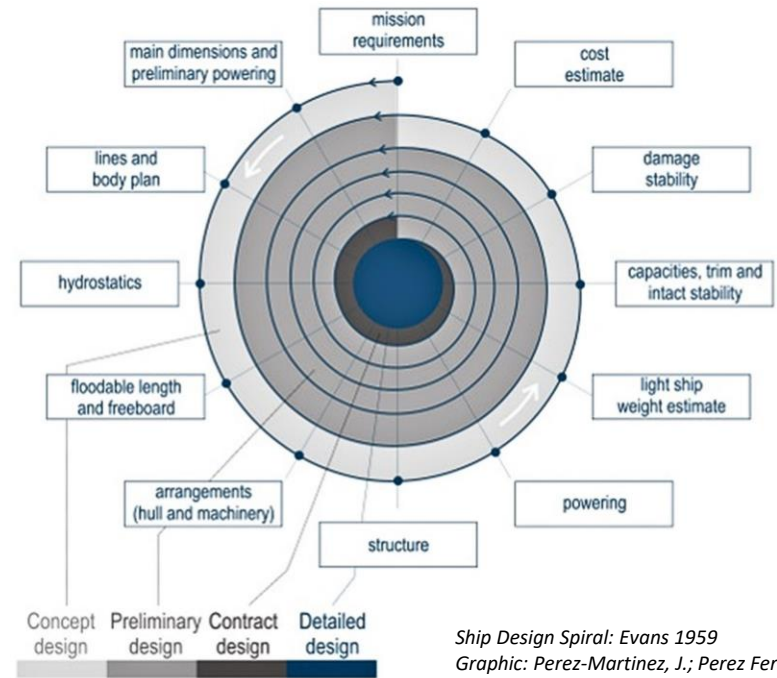
RMC DRIVERS

Challenges

"Faster delivery,
Better product,
Be competitive,
Keep a schedule."

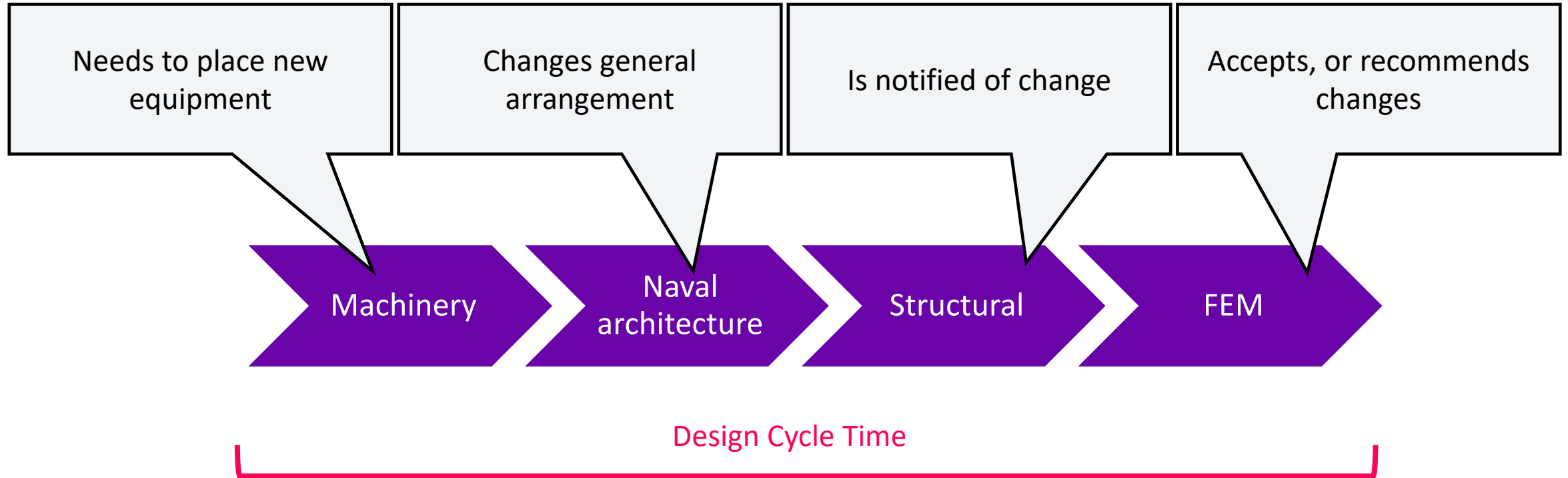
1. Enhance collaboration to shorten design lead time
2. Improve FEM response to structural changes

Lead time



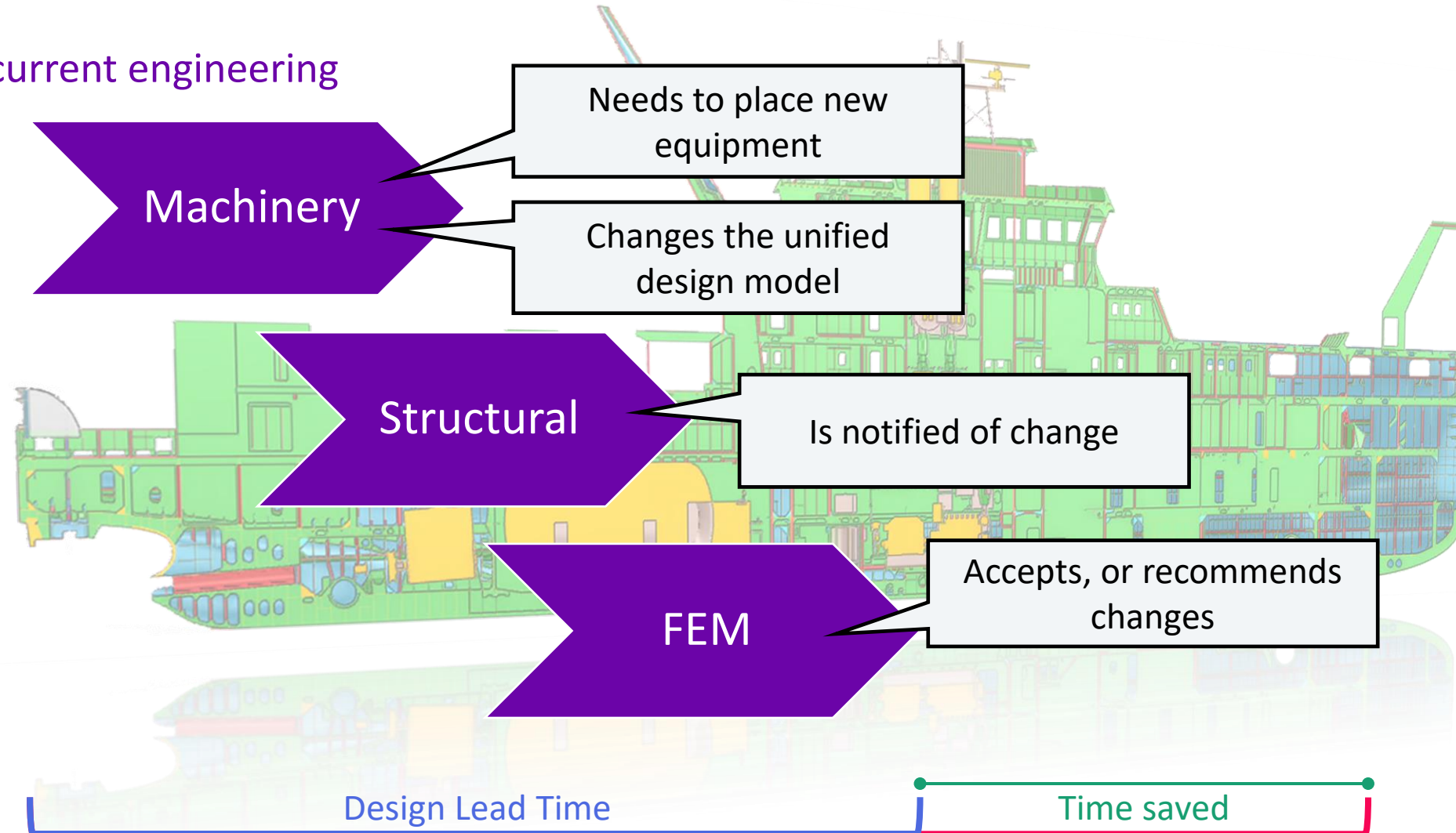
Earlier 3D collaboration

Worst case scenario



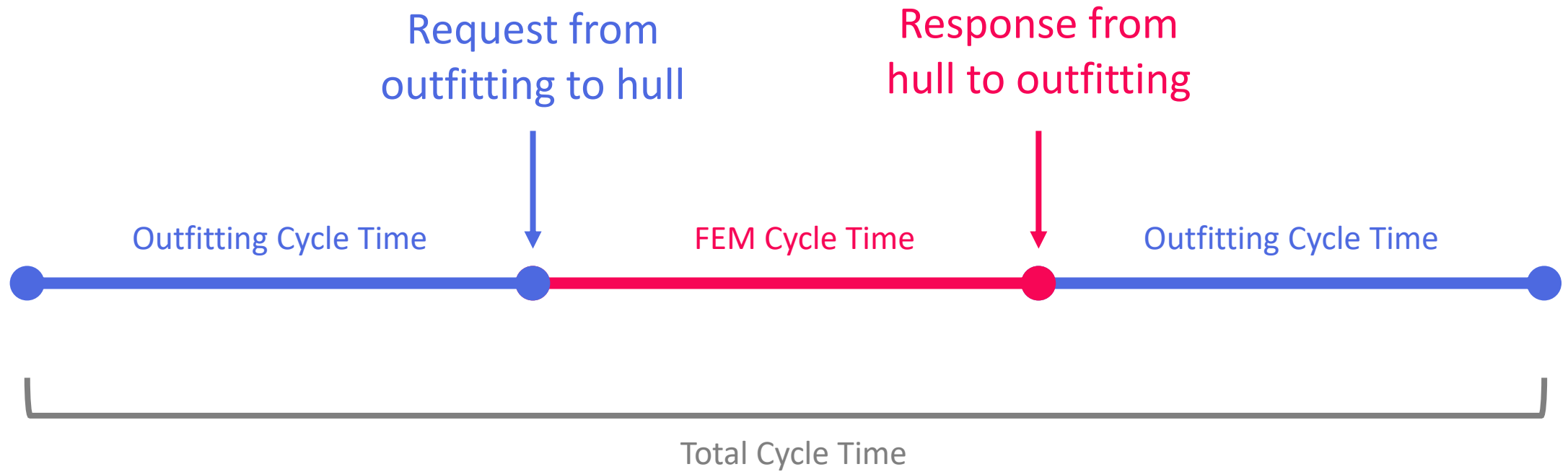
Earlier 3D collaboration

Goal: Concurrent engineering



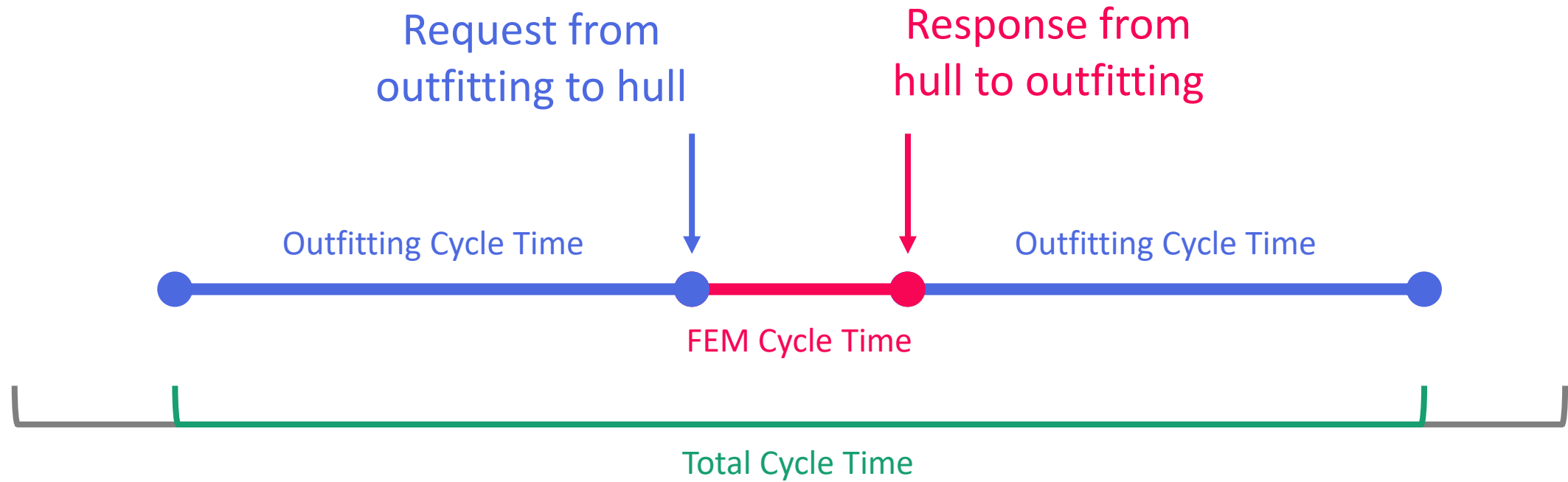
Faster FEM response

With current tooling



Faster FEM response

With enhanced tooling

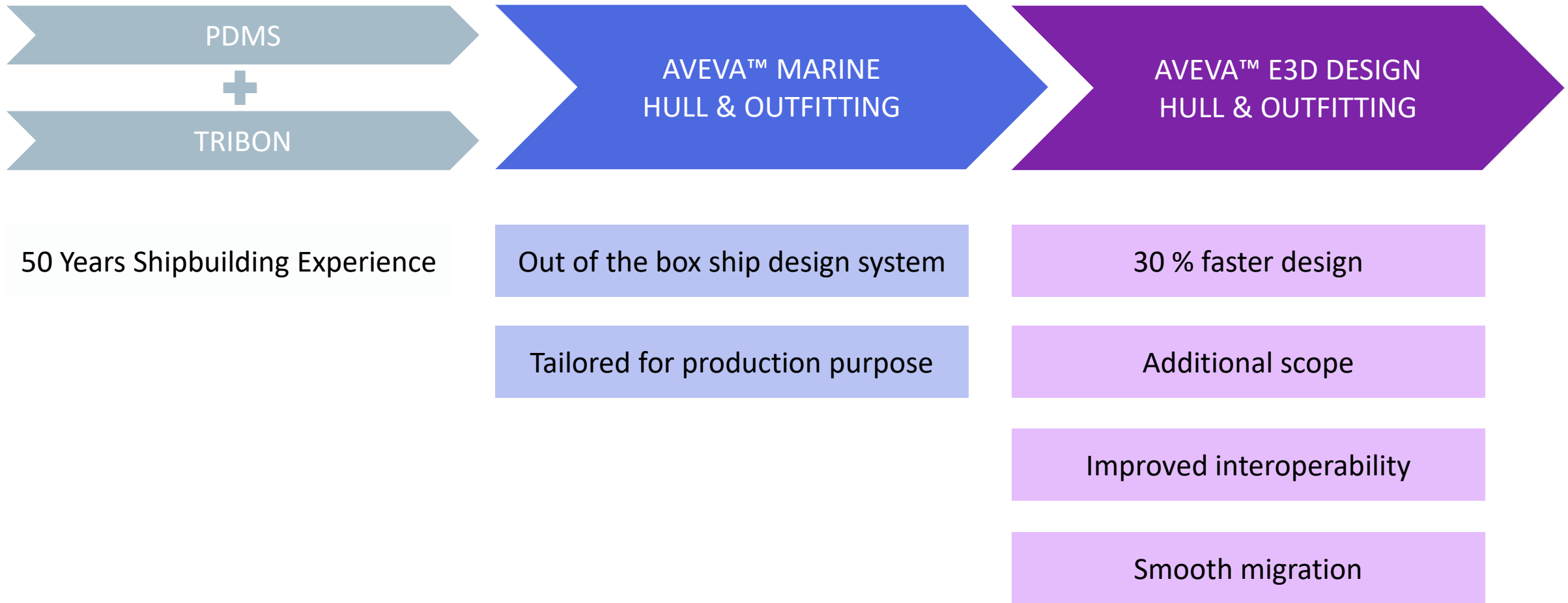


THE SOLUTION

AVEVA™ E3D to OCX to FEM

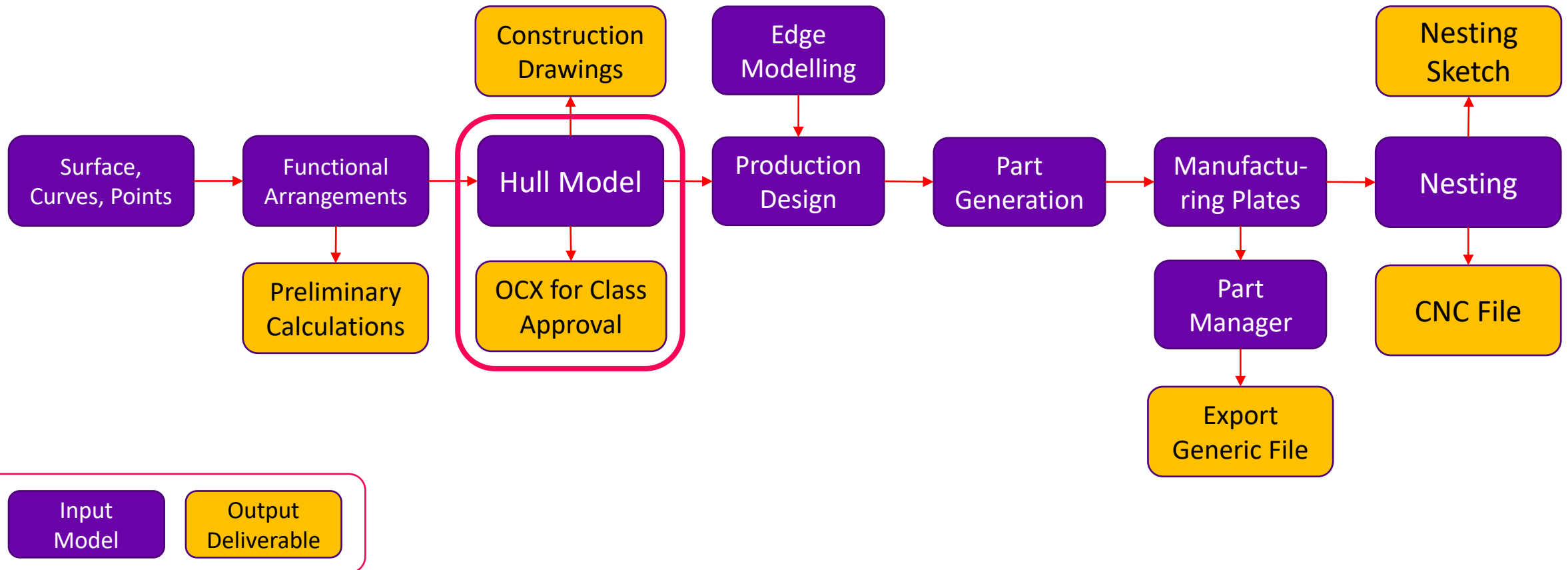
AVEVA

AVEVA™ E3D Design: The Ship Design System for the next 20 years



AVEVA™ E3D Design workflow

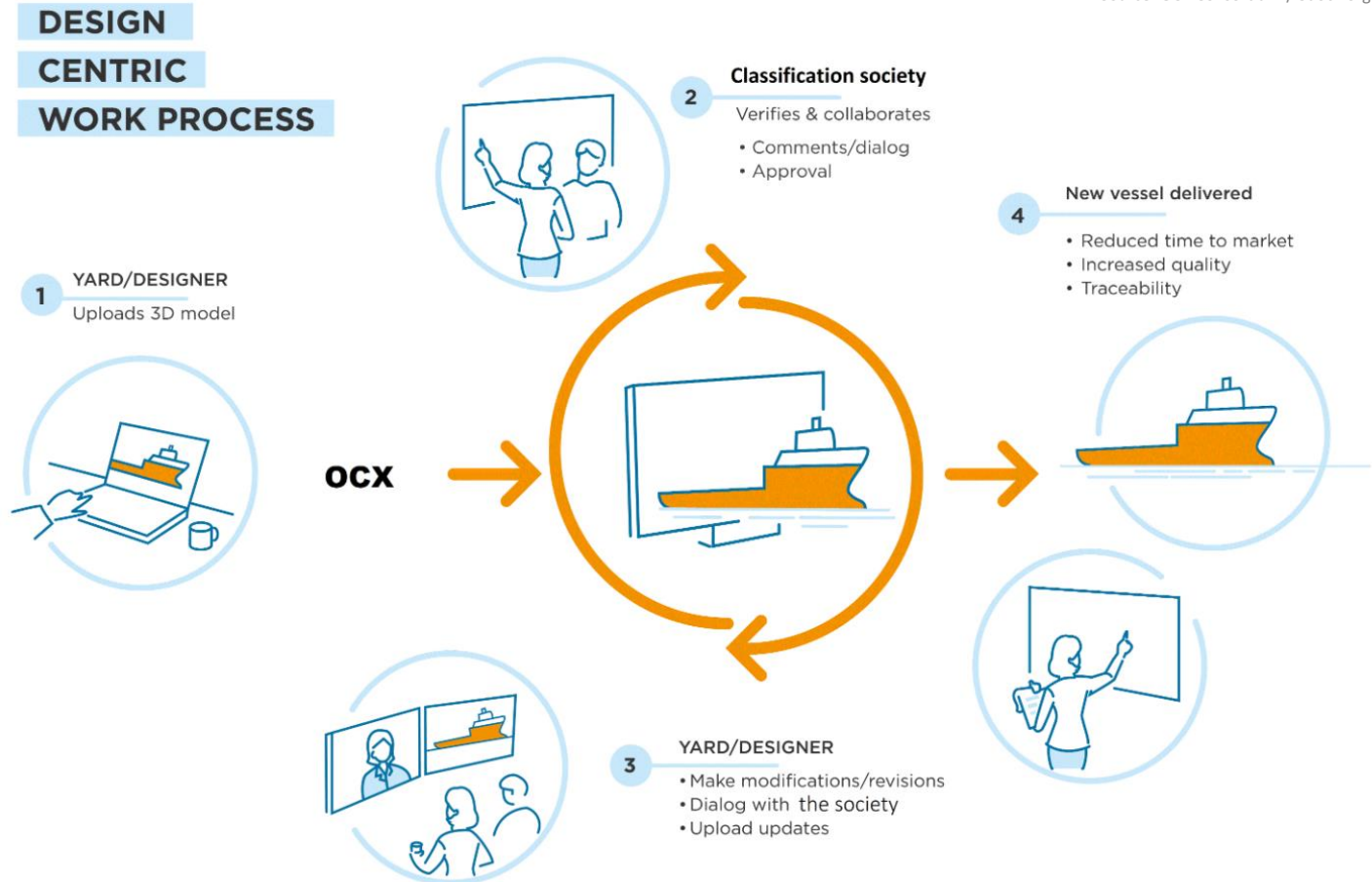
From modelling to production



Open Class 3D Exchange Standard (OCX)

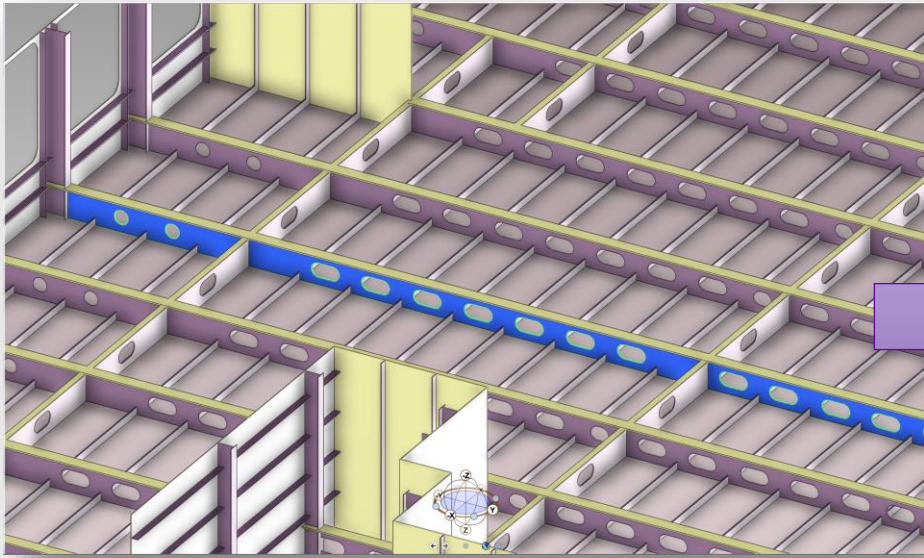
Engage in a fully digital workflow

Source: OCX Consortium / 3docx.org



- Model-based design approval
- OCX Consortium
 - Classification societies
 - Software vendors
 - Shipyards, design offices
- Future use cases?

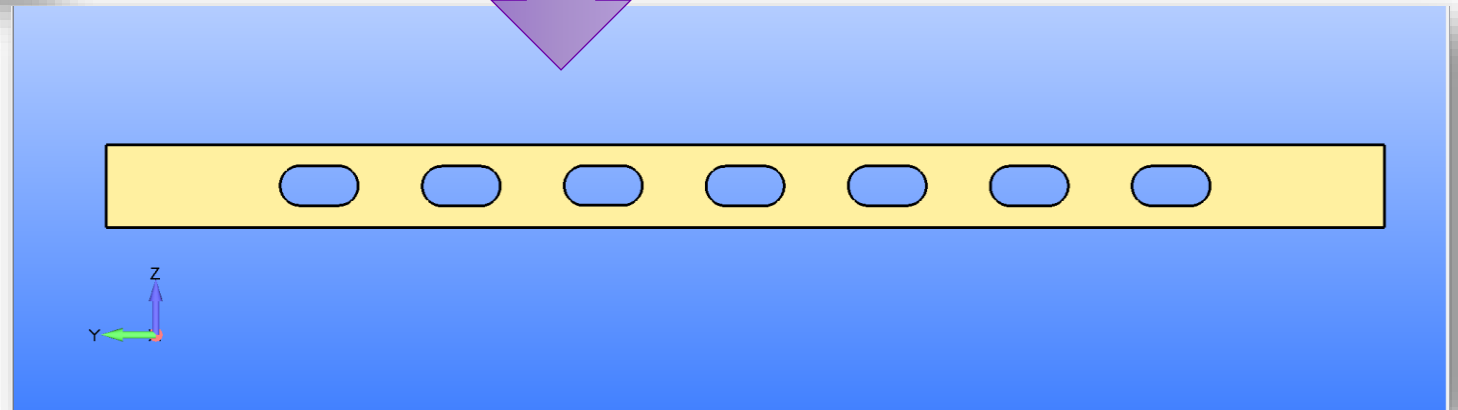
AVEVA™ E3D to OCX



E3D exports OCX file...

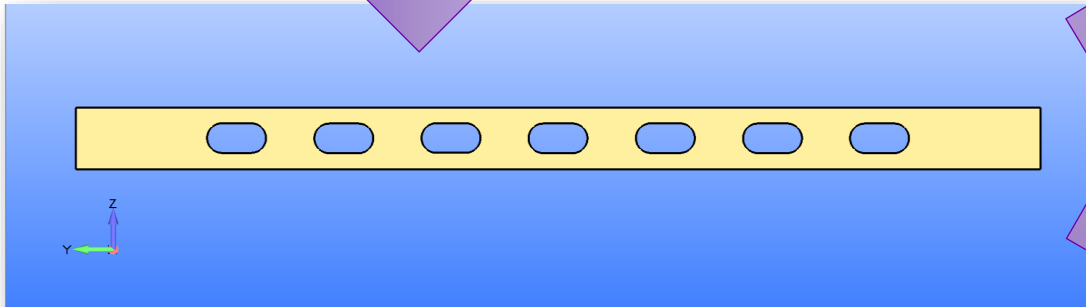
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...which is state-of-the-art exchange format for transferring ship structures [COMPIT 2023]

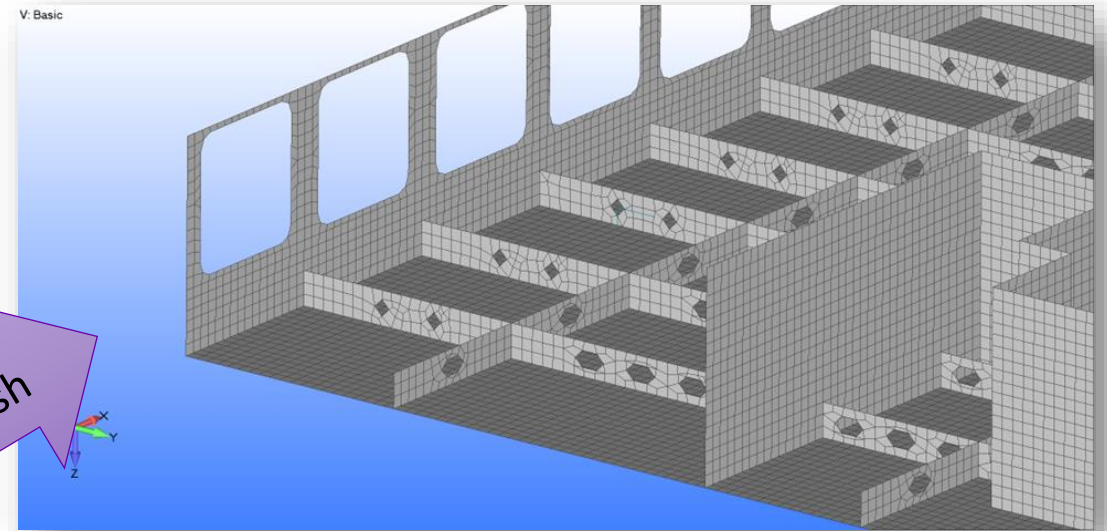


OCX to FEM

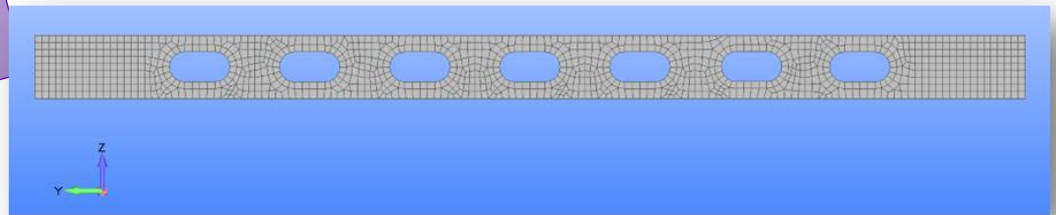
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```



base mesh



fine mesh



CASE STUDY

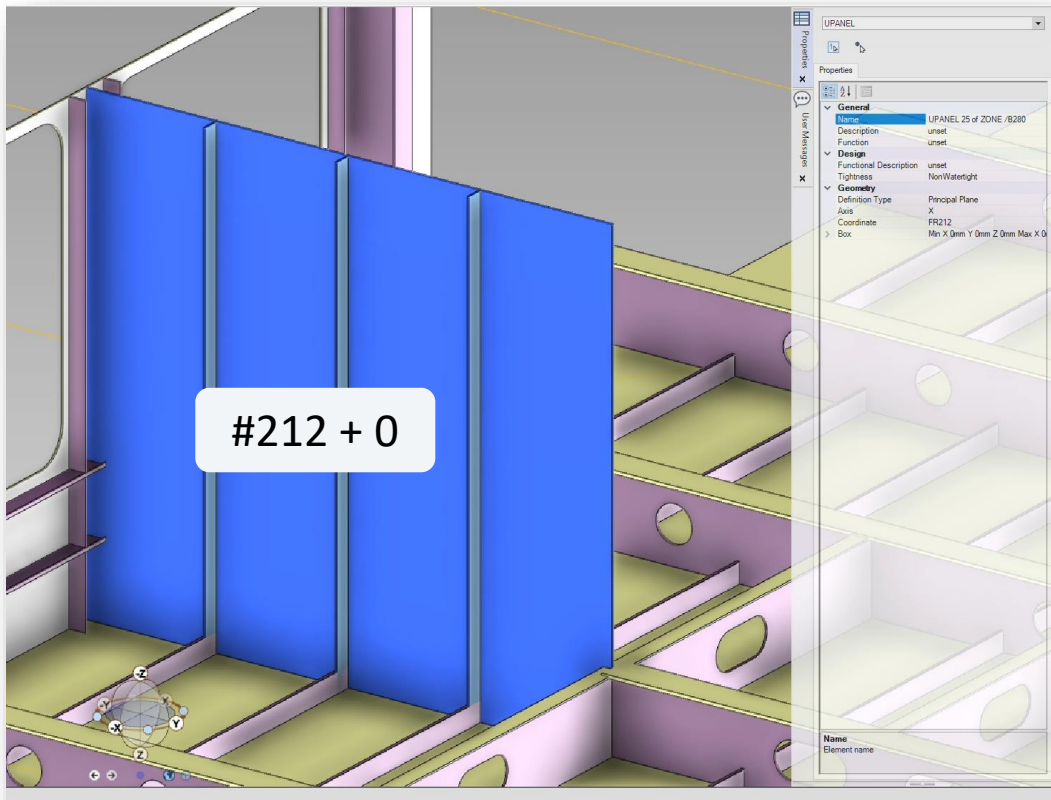
TT-Line ROPAX in E3D

TT-Line ROPAX remodelled in E3D

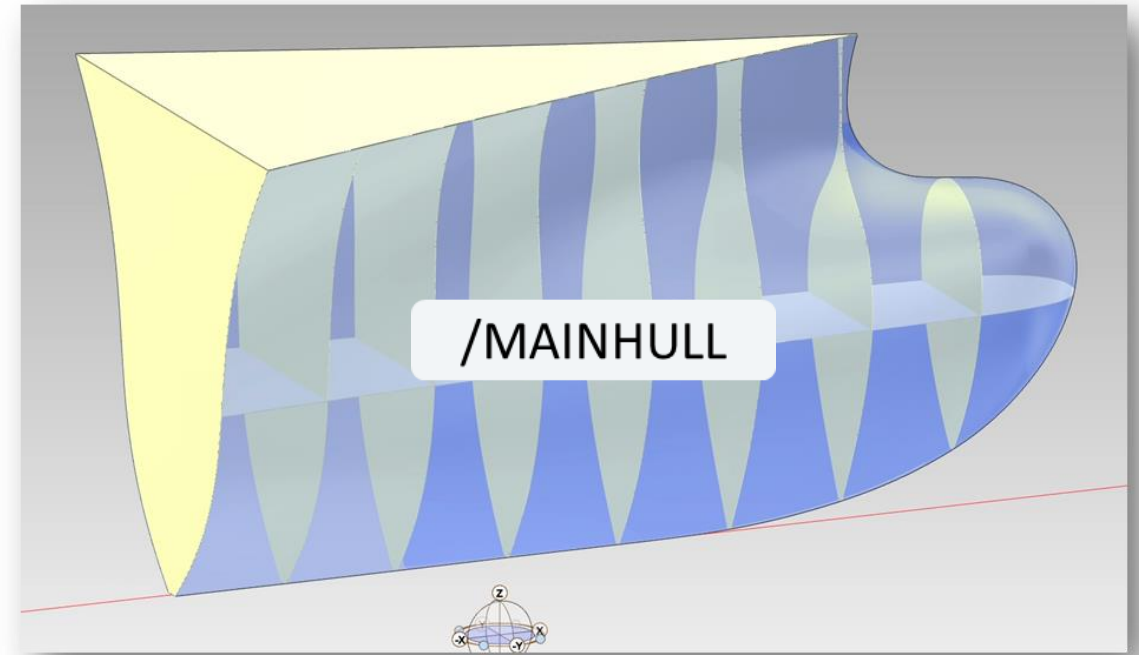


Panel Location

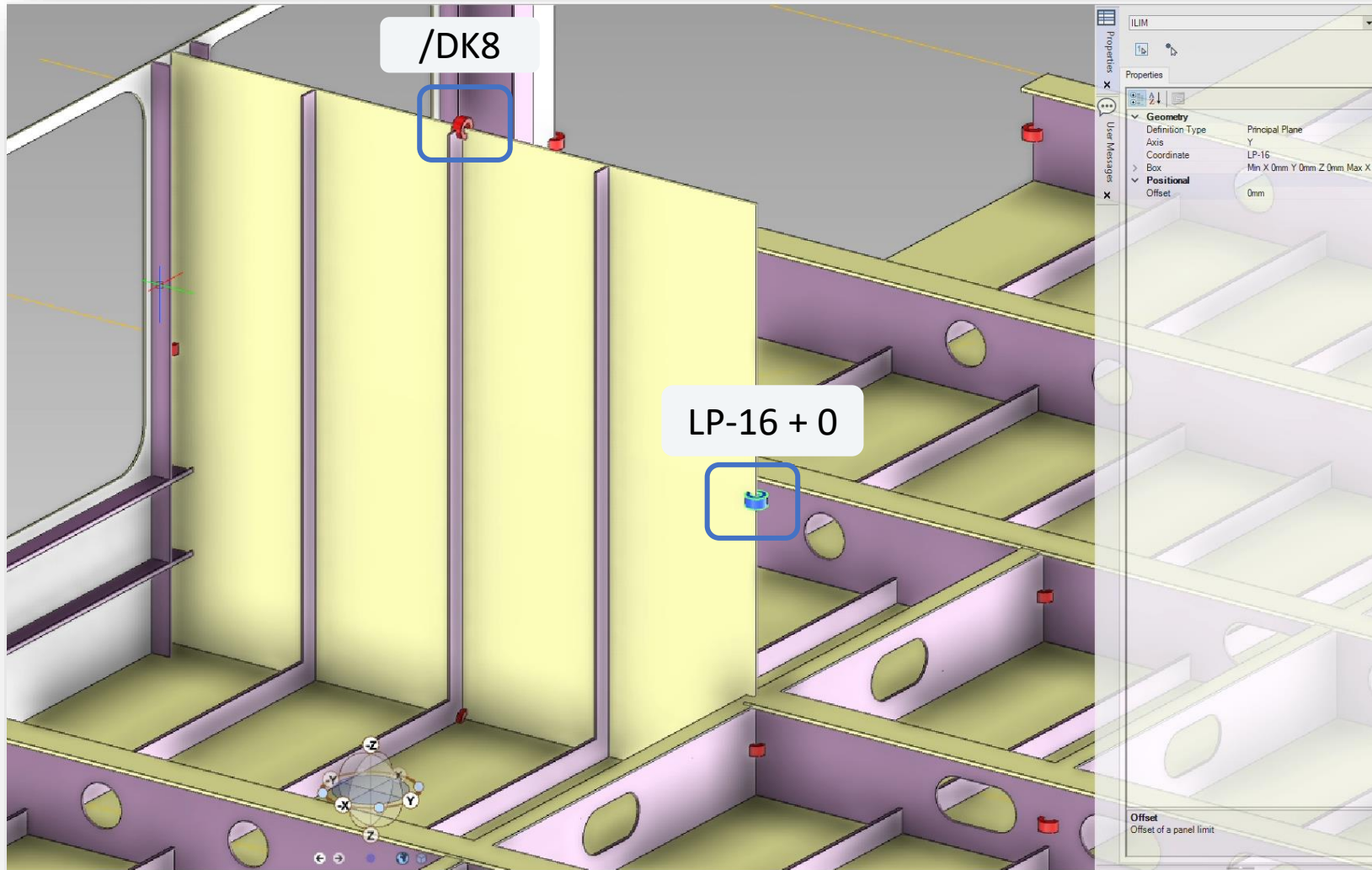
GRID PLANE



SURFACE



Panel Limits



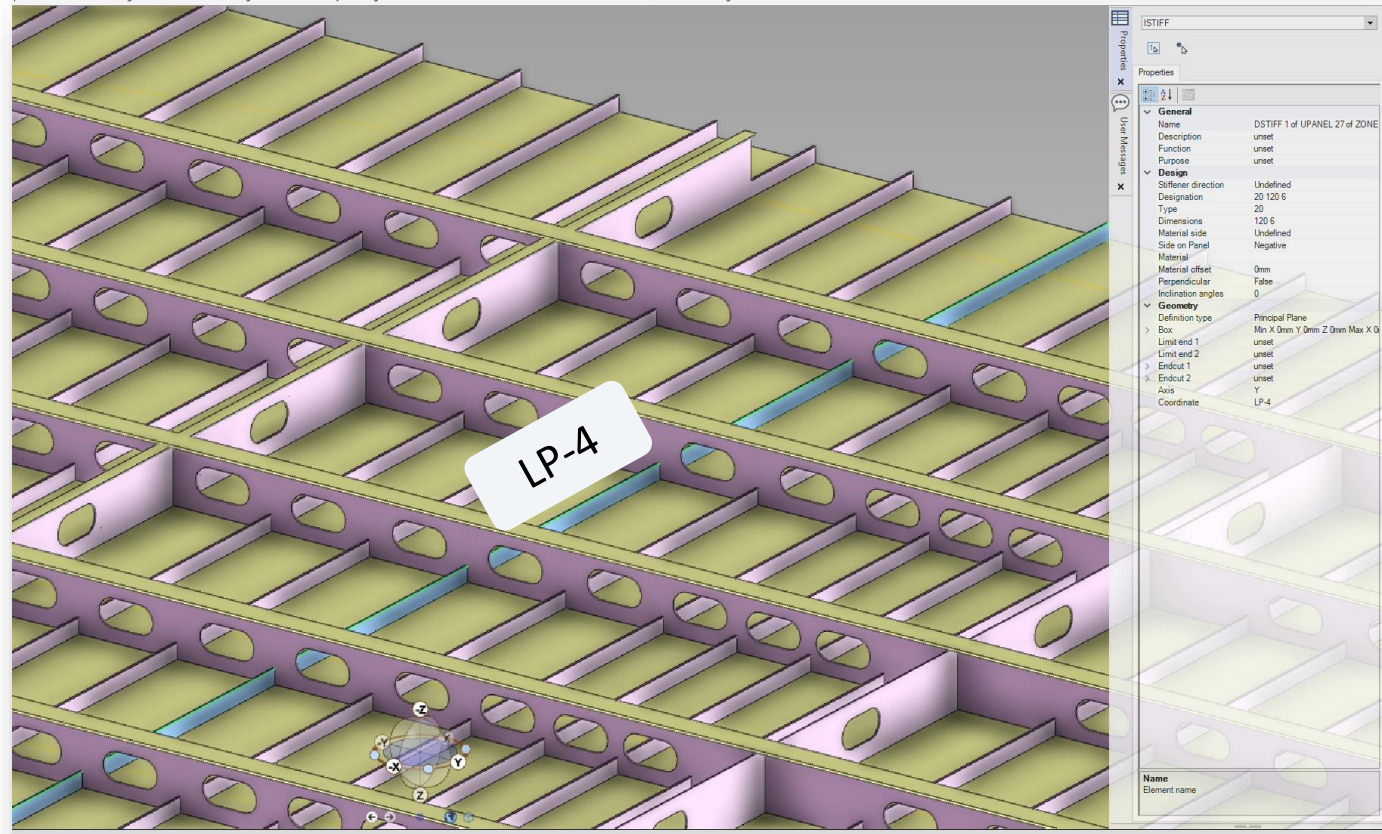
Panel Stiffeners

PRINCIPAL PLANE STIFFENING

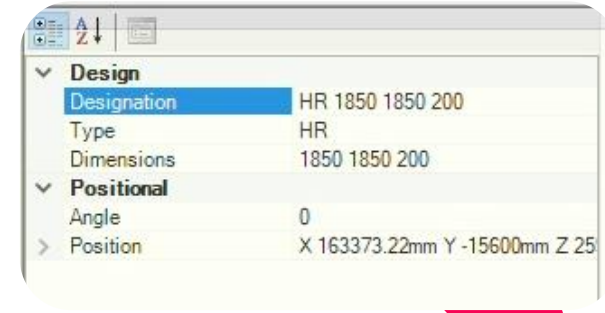
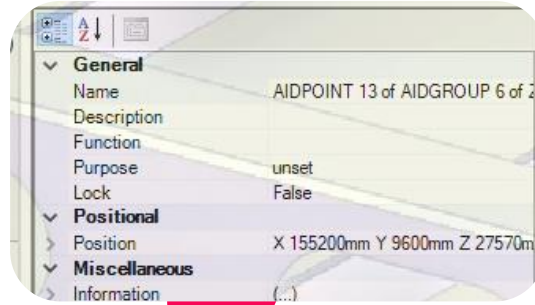
Geometry	
Definition type	Principal Plane
Box	Min X 0mm Y 0mm Z 0mm Max X 0
Limit end 1	unset
Limit end 2	unset
Endcut 1	unset
Endcut 2	unset
Axis	Y
Coordinate	LP-4

PROFILE (DESIGNATION)

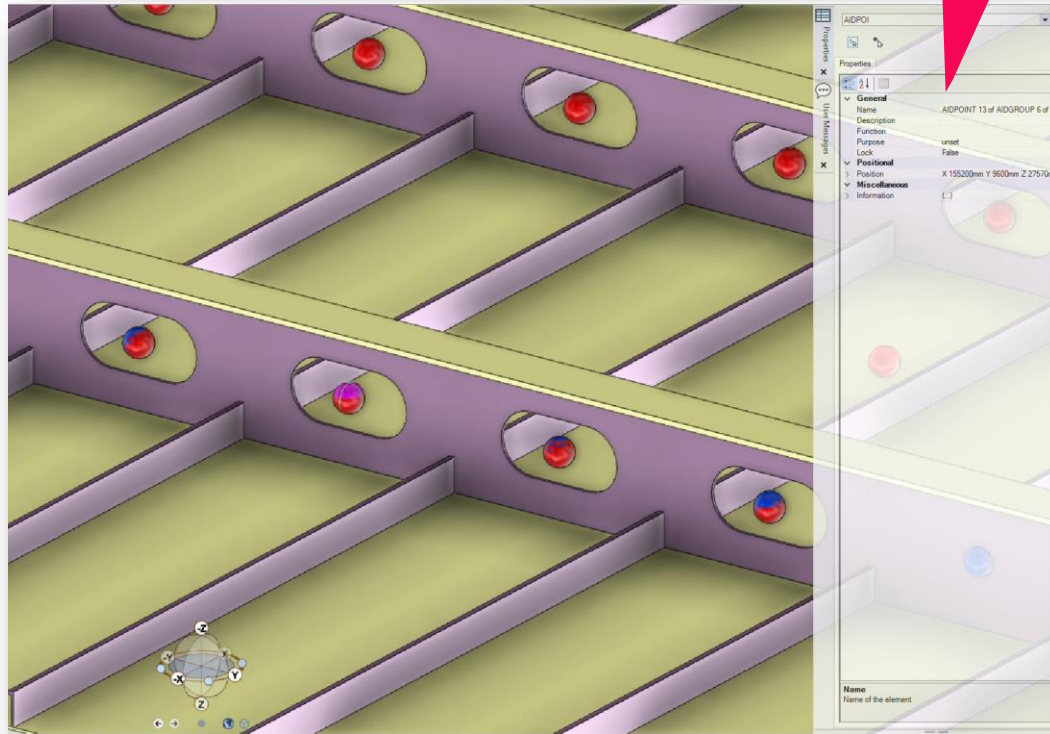
Design	
Stiffener direction	Undefined
Designation	20 120 6
Type	20
Dimensions	120 6



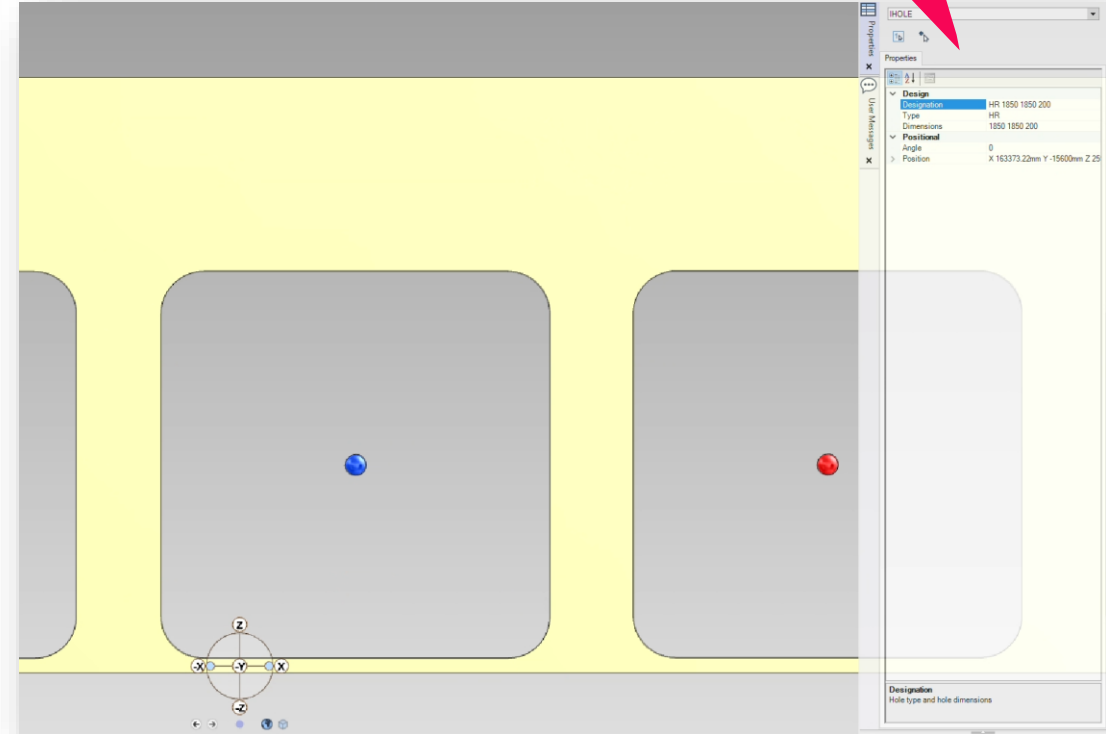
Panel Holes



POSITION (AIDPOINTS)

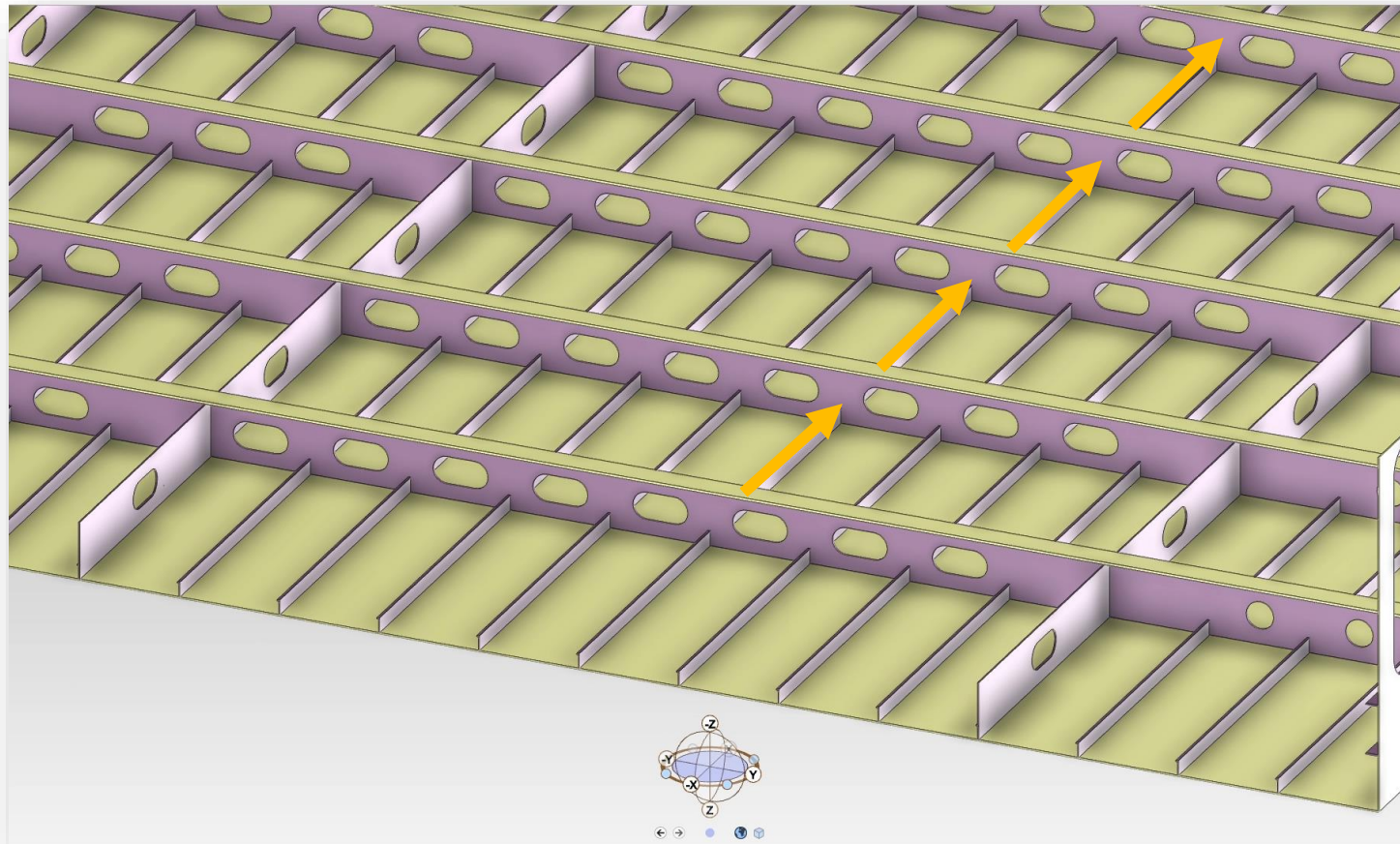


PROFILE (DESIGNATION)

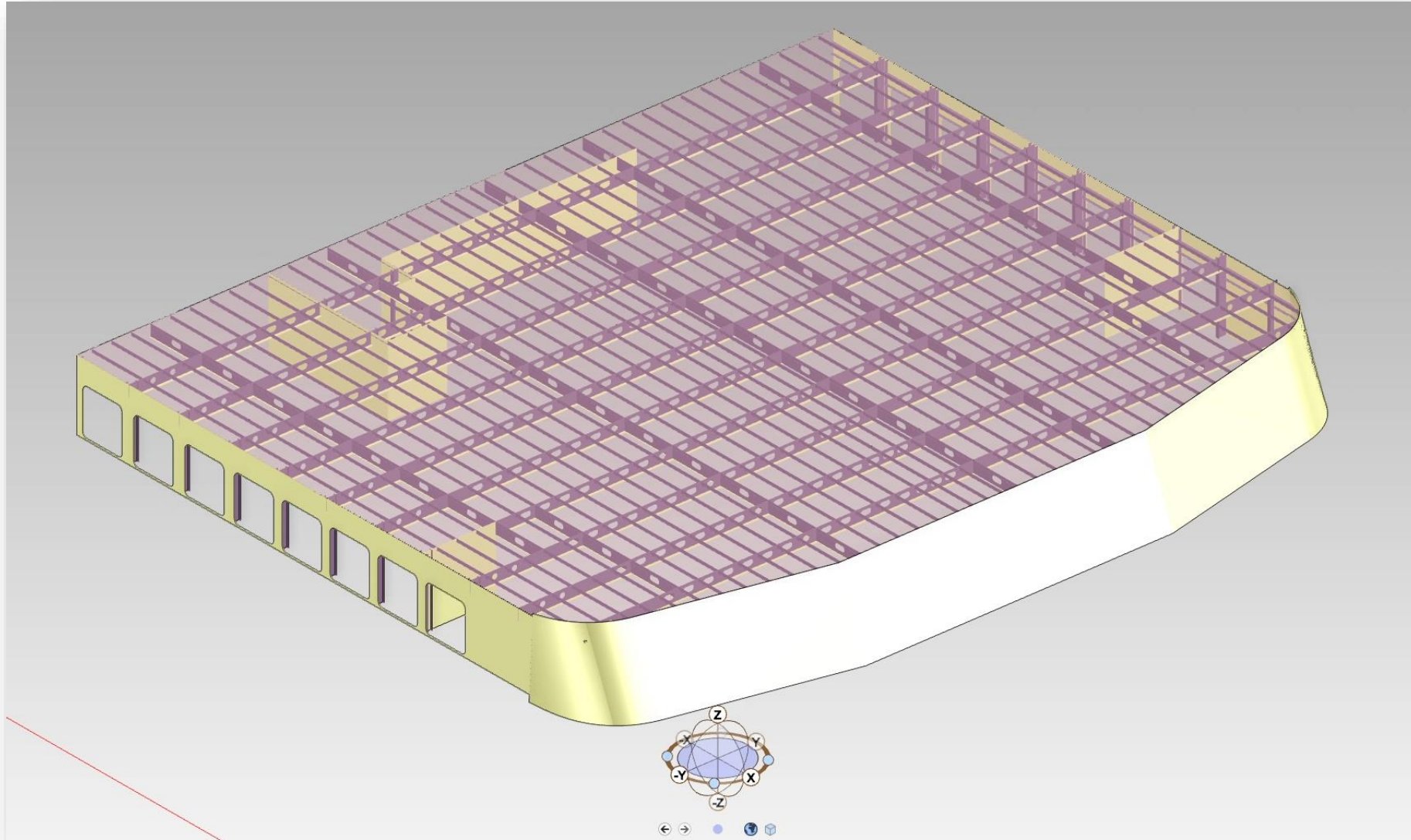


Panel Cloning

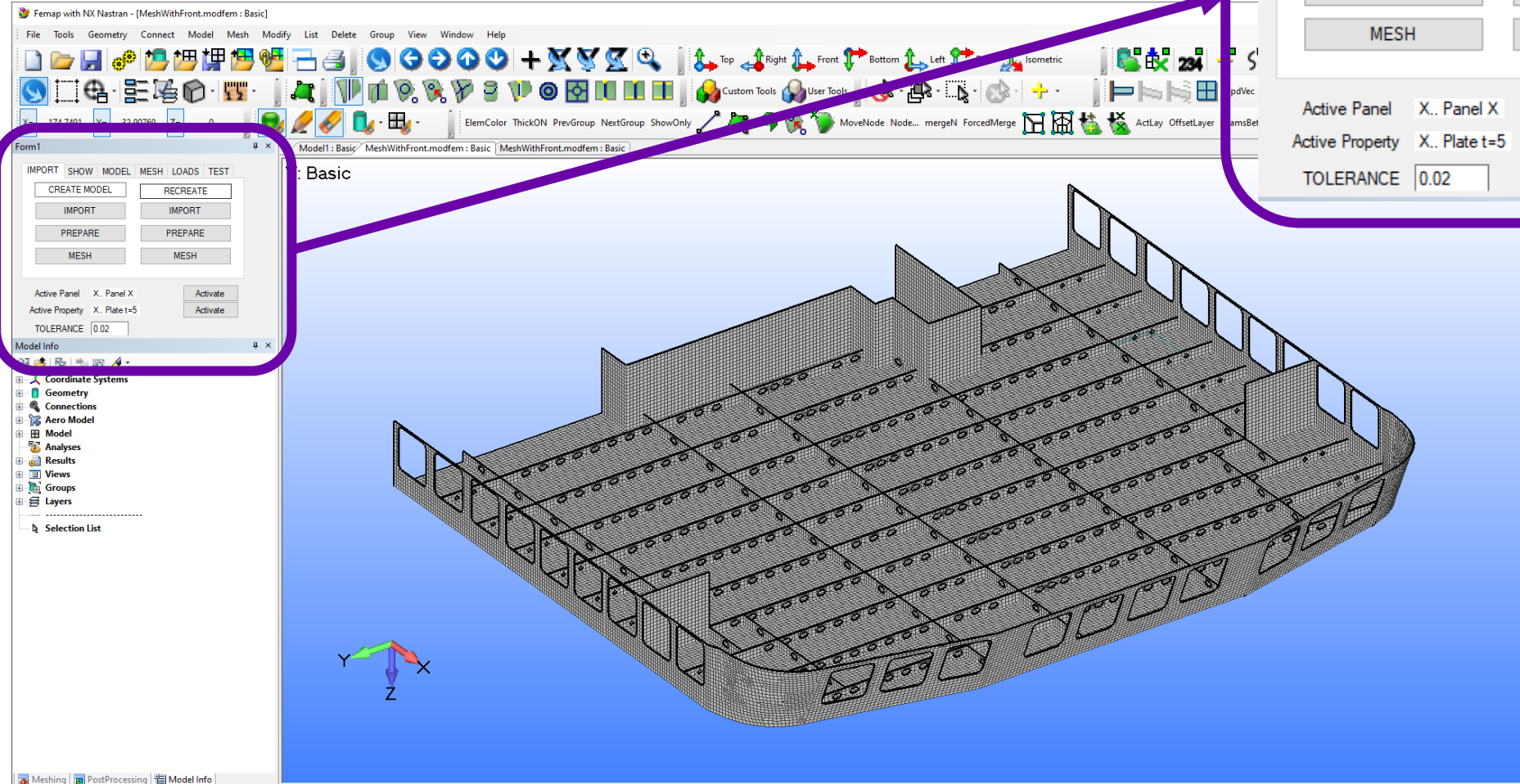
TYPICAL TRANSVERSE WITH OPENINGS CLONED



Result 1: E3D structures for unified design model



OCX to FEMAP (RSD plugin)



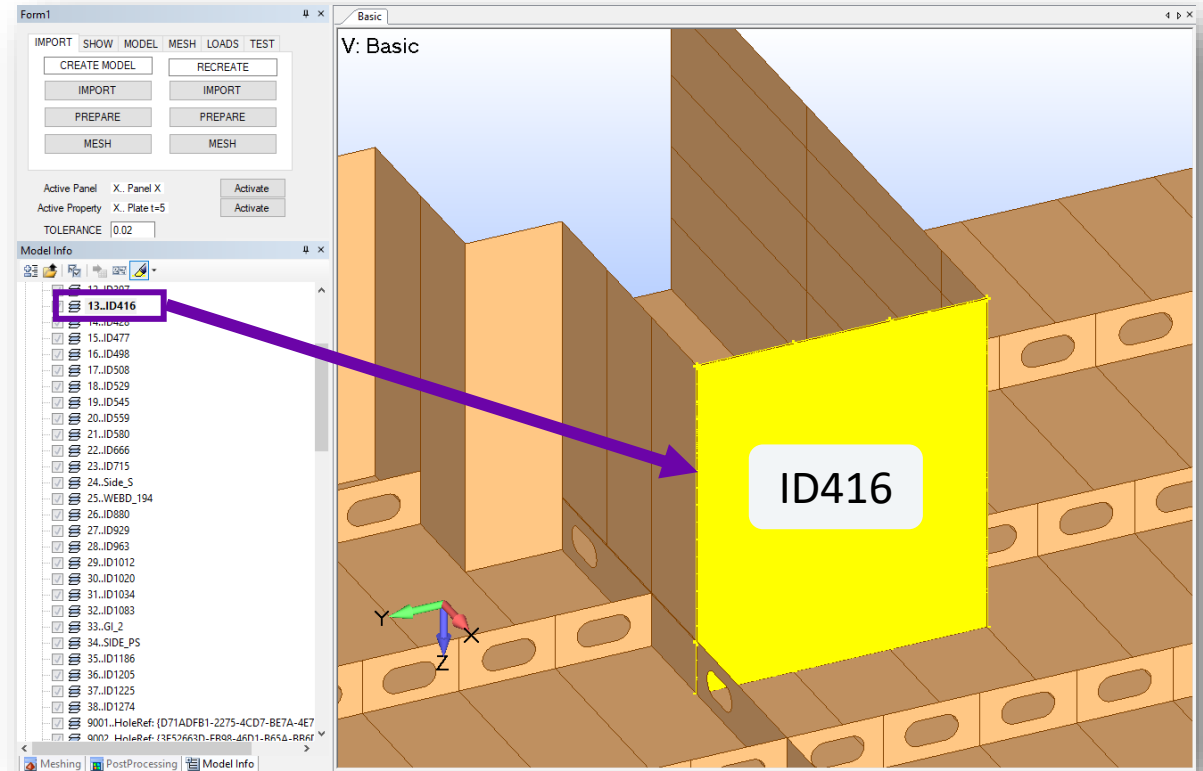
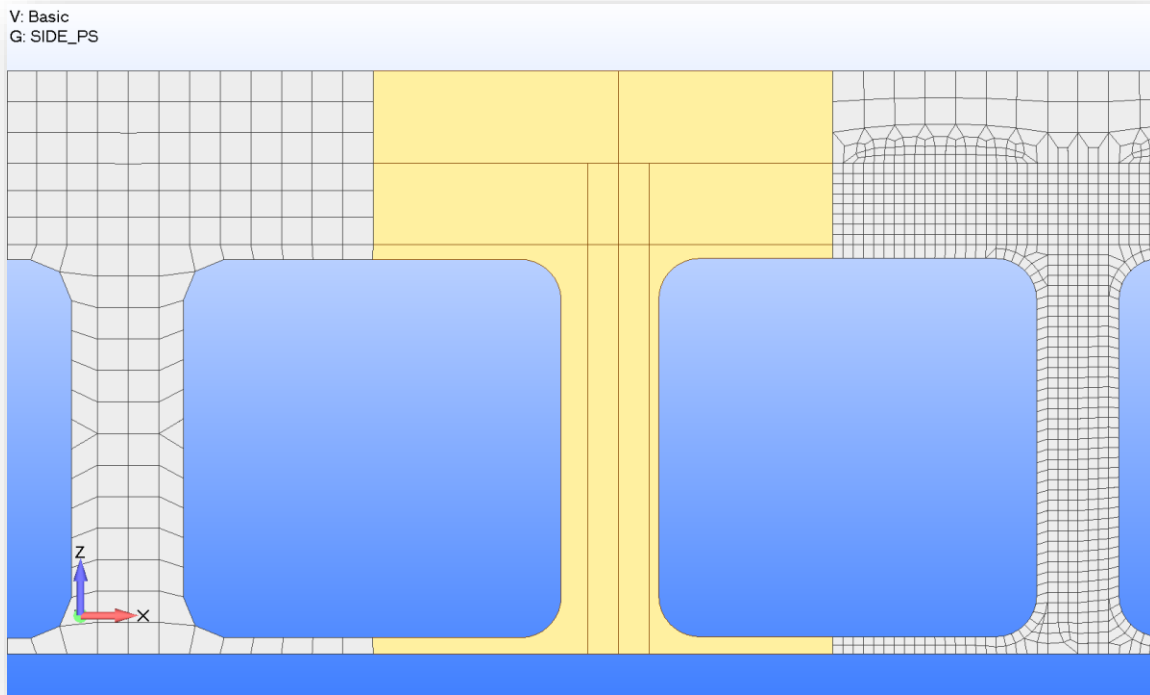
Result 2: OCX to Femap – Case evaluations

Analysis-ready mesh in 20 min vs. 120 min (-80 %)

Refinement in 5 min vs. 30 min (-80 %)

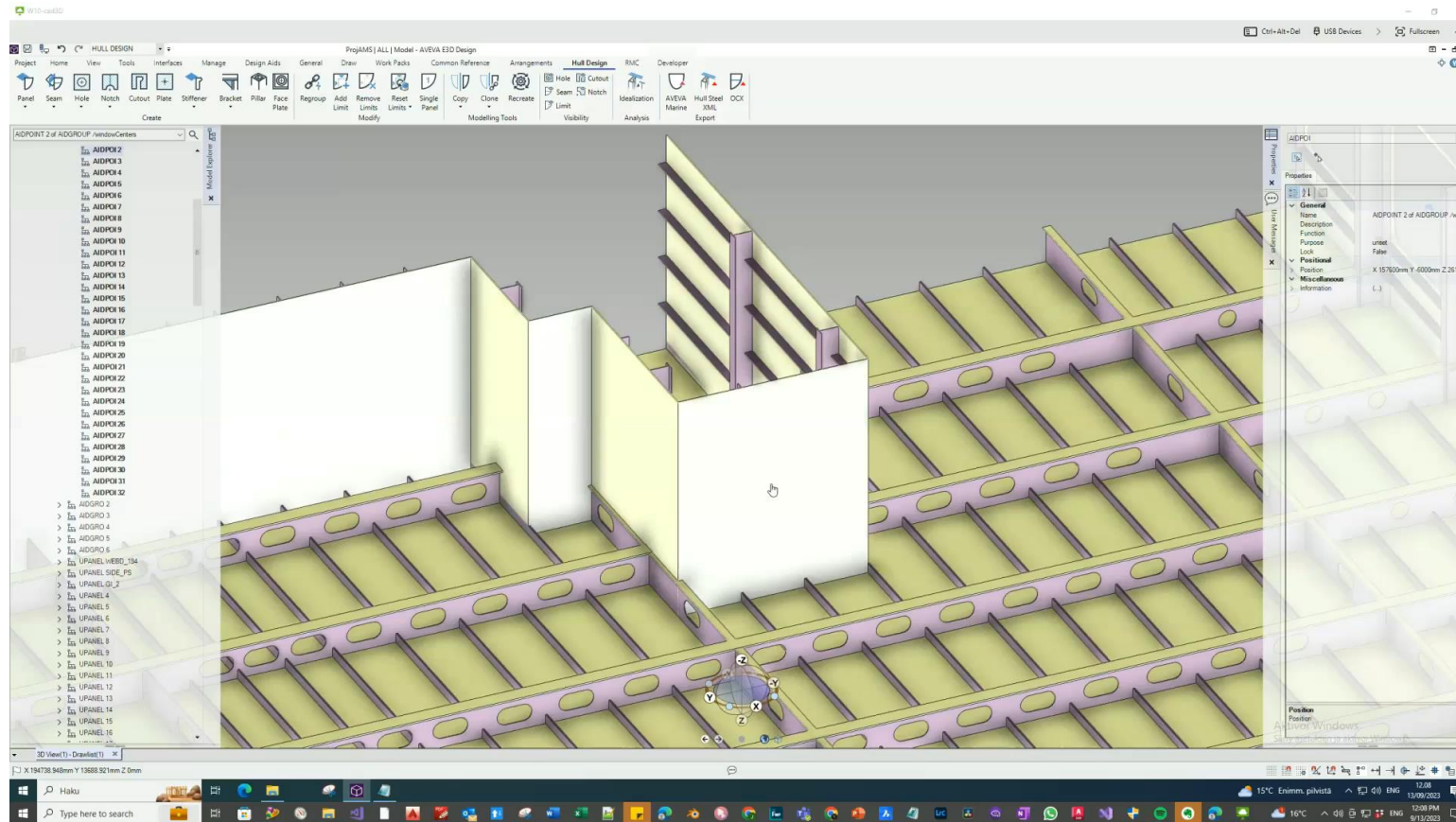
OCX ID's are preserved for automated updates

Update: 10 min vs. 60 min (-80 %)



Rapid change request FEA

FEA evaluation of change request is typically pending for days or even weeks. It could be done instantly.



RMC sees potential to reduce lead time with AVEVA™ E3D for structural design and FEM

Challenge

- Enhance collaboration to shorten design lead time.
 - Improve FEM response to structural changes.
- Keep schedule and shorten lead time.

Solution

- Earlier, more involved design collaboration with AVEVA™ E3D hull modelling.
- Streamlined E3D-to-Femap transfer for rapid FE modelling and updates.

Results

- Earlier availability of structural model.
- 80% time saved in FE model creation and update.



Questions?

Please wait for the microphone.
State your name and company.



Please remember to...

Navigate to this session in the mobile app to complete the survey.



Thank you!

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ABOUT AVEVA

AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

Learn more at www.aveva.com