

Forum

TERATEC

20 - 21 OCTOBRE 2026

PARIS · PALAIS DES CONGRÈS

Reinventing Simulation with AI

From High-Performance Computing to Real-Time Engineering

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STELLANTIS

20-21 October 2026

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Automotive **Engineering** at a **Breaking Point**

Cost, complexity, regulations, and data explosion converging.

Cost Pressure
- *Faster & cheaper*

System Complexity
- *Multi-domain*



Regulatory Demands
- *Stricter rules*

Data Explosion
- *Massive data*

More to deliver… in less time… with higher complexity.

AI is a key lever to address engineering challenges

FOUNDATIONS TO SCALE AI IN ENGINEERING

A structured approach to overcome deployment barriers

Key Enablers :

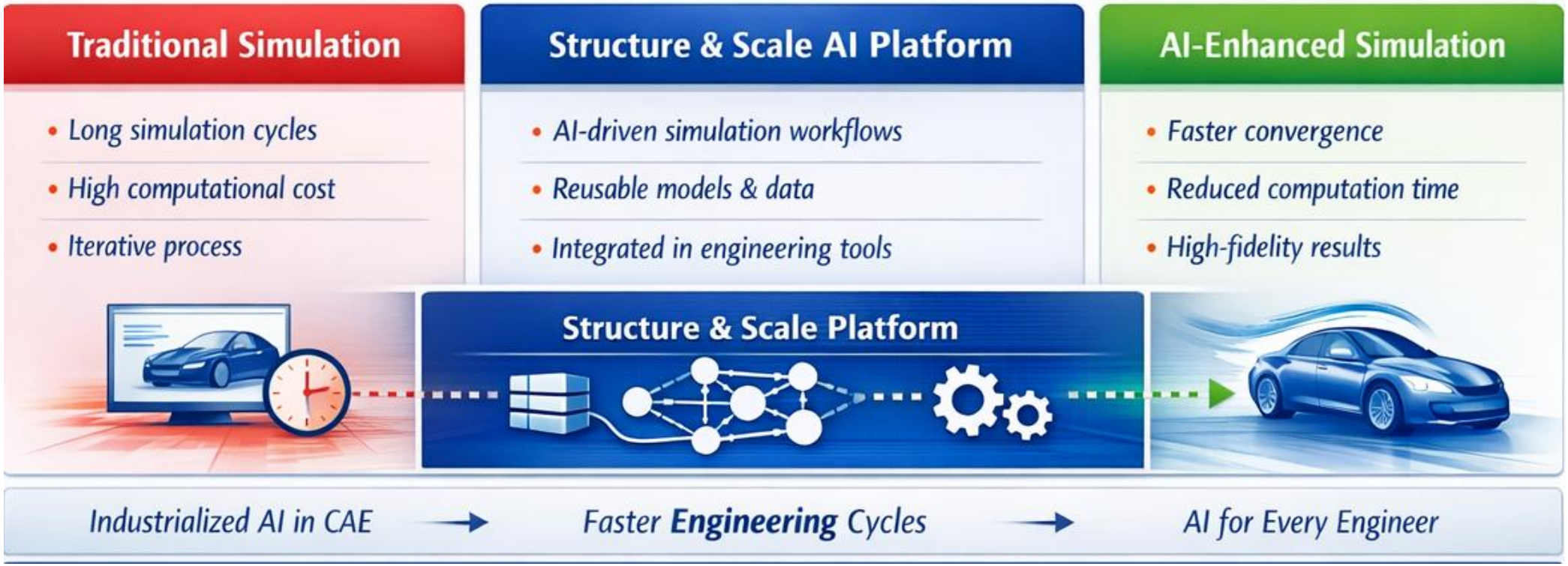
- **Capabilities – Hands-on AI teams**
- **Organization – Network & governance**
- **Frameworks – Modular and scalable**
- **Data – Cloud & knowledge foundation**



Fast development of concrete use cases that progressively connect into automated, end-to-end workflows

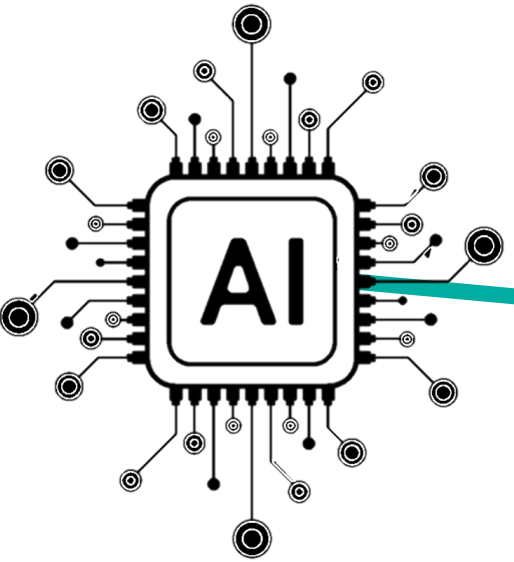
Target : to quickly deploy interconnected applications

From AI-assisted workflows to fully AI-driven systems



From intensive simulations to AI-accelerated engineering workflows

FOCUS ON DEEP LEARNING SURROGATE & HYBRID TWINS



AI for Simulation

Hybrid Twin

- To increase **PREDICTIVITY**
  → **Physical means reduction** up to **70%**

Deep Learning Surrogate Model

- To gain **SPEED & EFFICIENCY**
  → **300x faster**
  → **cost reductions** of over **85%**



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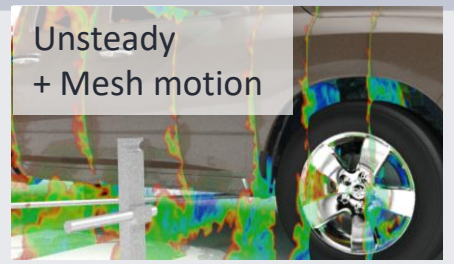
AI for Simulation

Deep Learning Surrogate Model

AI to speed up aerodynamics assessment

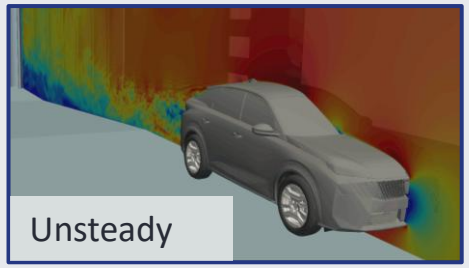
Conventional simulation (CFD)

SIMULATION ACCURACY



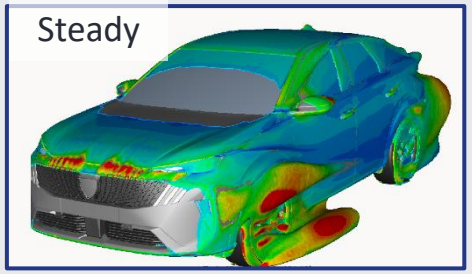
Hardware requirement:

~144 hours @ 504 cores



Hardware requirement:

~24 hours @ 504 cores



Hardware requirement:

~4 hours @ 504 cores

From **CFD** to **AI**

CFD Engineer

Deep Learning Physics model

Hardware requirement:

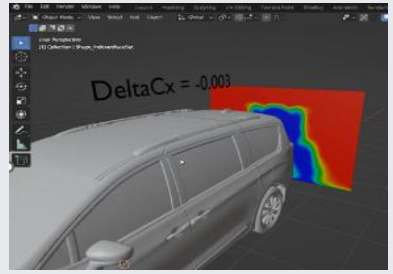
15h - 48h @ 1 GPU

CFD Engineer

New shapes' aero evaluations

Hardware requirement:

~250 s @ 1 GPU



CFD Engineer

Designers/Stylists

New shape assessment:
from **24 hours** to **4 minutes**

WE CAN INVENT NEW PROCESSES

TODAY | PROJECT-SPECIFIC SURROGATE

1 SPECIFIC AND HISTORICAL PROJECT DATA
DOE & HPC simulations

2 MODEL TRAINING
Adapt the AI model

3 LIVE CO-DESIGN
Real-time iterations

4 CONFIRMATION
High-fidelity CFD

HPC effort is anticipated — not removed

Once trained: minutes per prediction, rapid cross-functional loops to shorten convergence

TOMORROW | FOUNDATION MODEL

PRE-TRAINED FOUNDATION MODEL
Broad physics + geometry knowledge

PROJECT-SPECIFIC USE
No fine-tuning • direct inference

REAL-TIME ENGINEERING
Lower project compute • scalable deployment

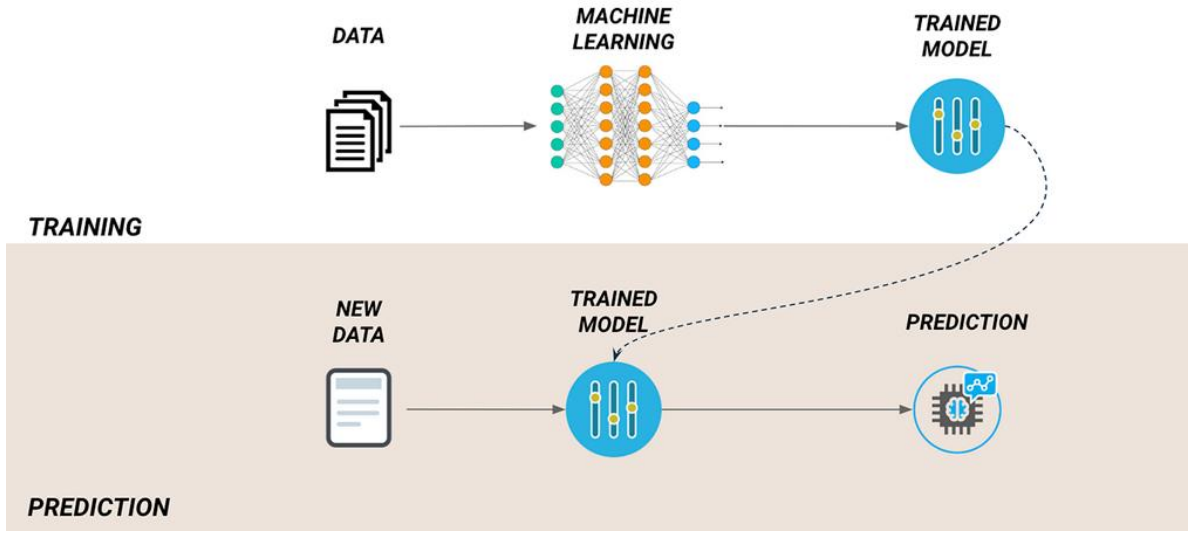
Shift compute upstream today — eliminate project-specific retraining tomorrow

AI for Simulation

Hybrid Twin

AI to improve CAE acceleration signal accuracy using physical test data

FROM PHYSICS-BASED CAE TO A HYBRID PREDICTION



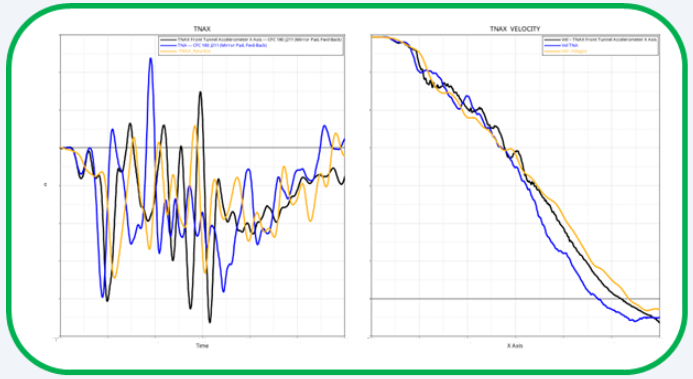
PHYSICS-BASED KNOWLEDGE

- Vehicle definition
- Impact boundary conditions
- Structural deformation

DATA-LEARNED CORRECTION

- Damping & high-frequency response
- Material / rupture effects
- Sensor representation

IMPROVED SENSING PREDICTION



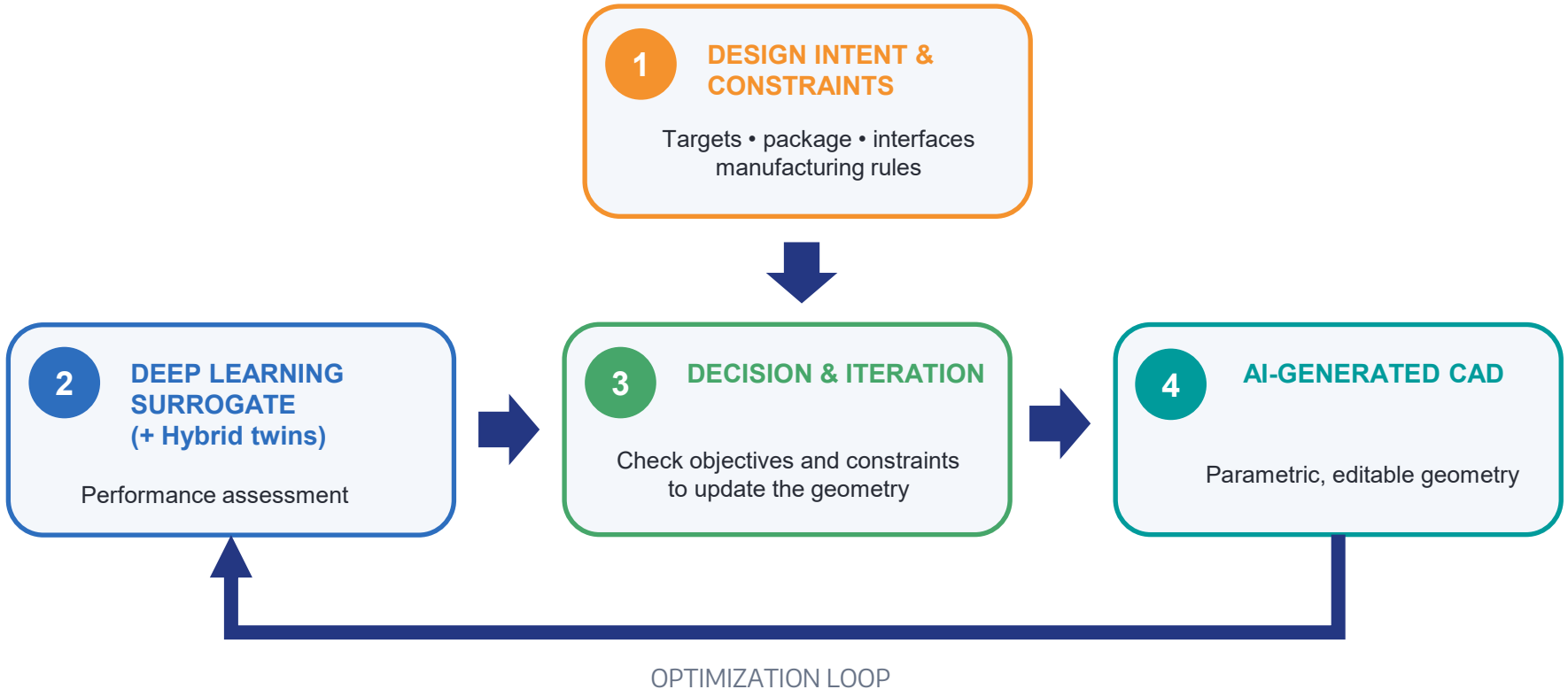
acceleration velocity

TIME-TO-FIRE PREDICTION ERROR

27% CAE → **7%** HYBRID TWIN

Hybrid Twin = explainable physics + data-driven correction for higher sensing accuracy

The next step: generate simulation-ready geometries inside iterative engineering loops



From AI that predicts performance to AI that proposes the geometry to achieve it

MAIN TAKEAWAYS

❑ AI for simulation is already delivering value

- Deep Learning surrogates & Hybrid Twins are accelerating simulations and improving predictivity
- Significant progress achieved in only 3 years, much faster than the initial adoption of CAE

❑ The transition is not complete

- Some complex domains, such as frontal crash, are not yet fully covered
- Computing effort is shifted upstream rather than fully eliminated

❑ The next frontier is closed-loop engineering

- Foundation models will reduce project specific retraining
- From optimization loop to diffusion model for design generation

Question for panel discussion: are we ready not only to deploy AI tools, but also to redesign our engineering processes around them?

THANKS FOR YOUR ATTENTION !