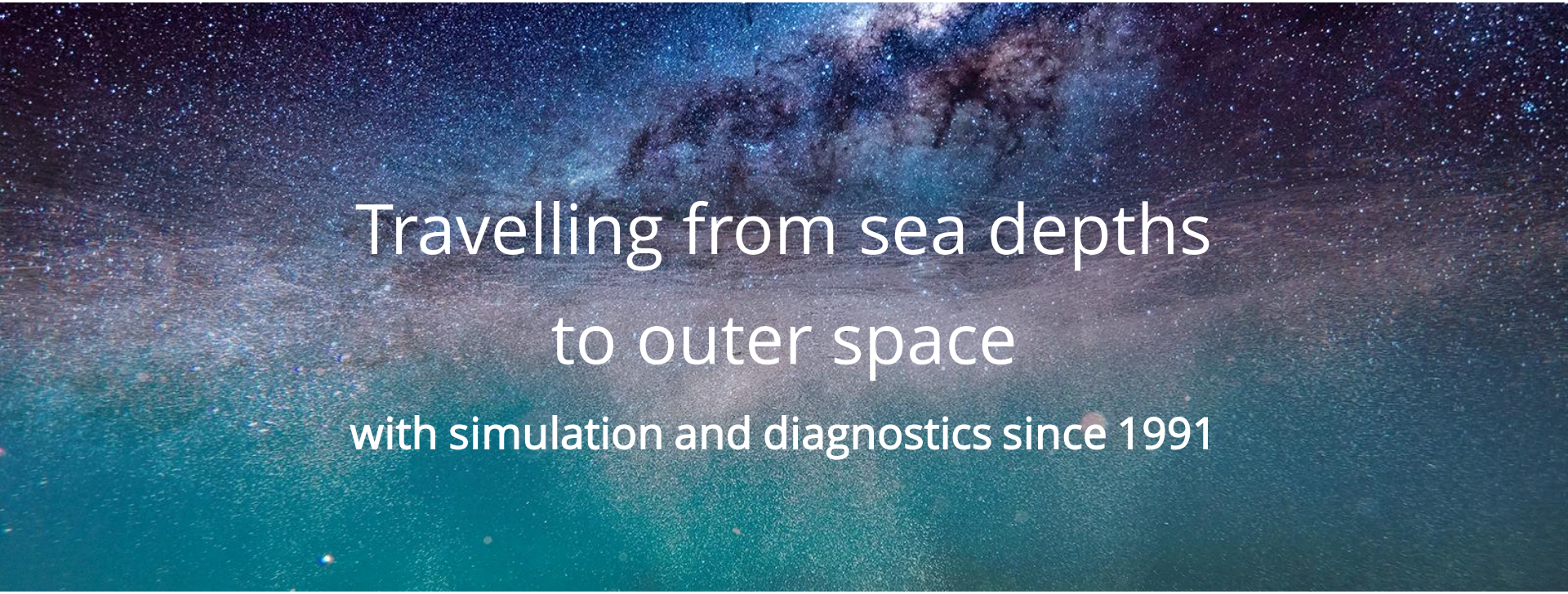
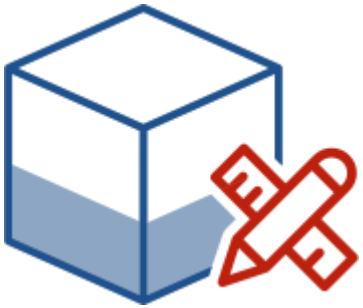
SATE

Engineering passion!



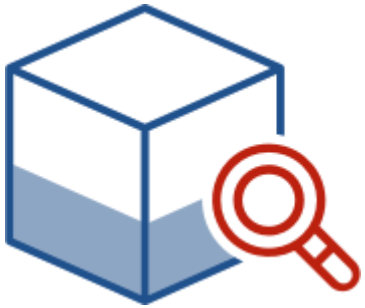
Company introduction

SATE is an R&D and engineering company providing advanced and forefront customised software products and services for simulation, diagnostics and data analysis in the automotive, space and energy fields.



Modelling and Simulation

Diagnostics and Prognostics



Data mining

Company introduction

VISION

Supporting our customers to find concrete and innovative solutions to complex engineering problems.

Company introduction

MISSION

Defining future technologies driven by Systems Engineering principles, thanks to 30-years activity experience and to the continuous transfer of knowledge among various application domains.

Focusing the attention on the growth and development of talents, SATE continues being a laboratory of ideas based on robust multidisciplinary background.

SATE timeline

SYSTEMS ENGINEERING

COMPANY SET UP

1991

SIMULATION

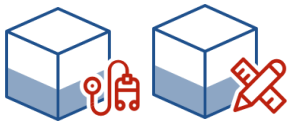
ENERGY

1998

AUTOMOTIVE

2000

DIAGNOSTICS



2011

DATA MINING

2014

SPACE

2016

MEDICAL & MARITIME spin-offs

Key competences

1. Systems and software **engineering**
2. Systems **physical mathematical modelling**
3. **Systems simulation** (also real-time)
4. **Artificial Intelligence & Machine Learning** for knowledge extraction from data, systems modelling, anomaly detection
5. Model-based and data-driven **diagnostics**
6. **Control systems**

SATE in numbers

180+
COMMERCIAL PROJECTS

20+
RESEARCH PROJECTS

70+
PUBLICATIONS

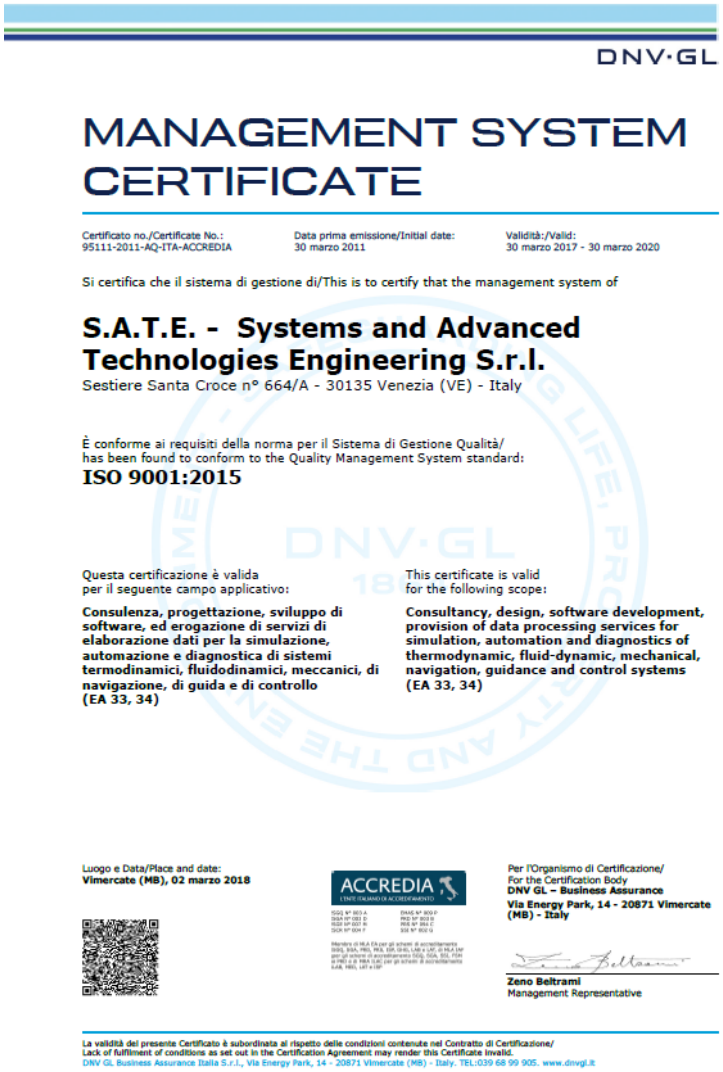
20+
PATENTS

25+
EUROPEAN CUSTOMERS

4
ASIAN CUSTOMERS

15-20
PEOPLE

SATE ISO 9001-2015 certification



DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificato no./Certificate No.: 95111-2011-AQ-ITA-ACCREDIA

Data prima emissione/Initial date: 30 marzo 2011

Validità:/Valid: 30 marzo 2017 - 30 marzo 2020

Si certifica che il sistema di gestione di/This is to certify that the management system of

S.A.T.E. - Systems and Advanced Technologies Engineering S.r.l.

Sestiere Santa Croce n° 664/A - 30135 Venezia (VE) - Italy

È conforme ai requisiti della norma per il Sistema di Gestione Qualità/ has been found to conform to the Quality Management System standard:

ISO 9001:2015

Questa certificazione è valida per il seguente campo applicativo:

Consulenza, progettazione, sviluppo di software, ed erogazione di servizi di elaborazione dati per la simulazione, automazione e diagnostica di sistemi termodinamici, fluidodinamici, meccanici, di navigazione, di guida e di controllo (EA 33, 34)

This certificate is valid for the following scope:

Consultancy, design, software development, provision of data processing services for simulation, automation and diagnostics of thermodynamic, fluid-dynamic, mechanical, navigation, guidance and control systems (EA 33, 34)

Luogo e Data/Place and date: **Vimercate (MB), 02 marzo 2018**

ACCREDIA

Per l'Organismo di Certificazione/ For the Certification Body
DNV GL – Business Assurance
Via Energy Park, 14 - 20871 Vimercate (MB) - Italy

Zeno Beltrami
Management Representative

La validità del presente Certificato è subordinata al rispetto delle condizioni contenute nel Contratto di Certificazione/ Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.
DNV GL Business Assurance Italia S.r.l., Via Energy Park, 14 - 20871 Vimercate (MB) - Italy. TEL:039 68 99 905. www.dnvgl.it

Consultancy, design, software development and services supply for the data elaboration, the simulation, the automation and diagnosis of thermodynamical systems, fluid dynamic systems, mechanical systems, navigation systems and driving and control systems.

SIMULATION SERVICES AND PRODUCTS

Physical-Mathematical simulation to verify and optimise thermo-dynamic or mechanical systems design and control

Simulation services and products

ENERGY

- **ACUSYS®**
  Analysis of pressure pulsations in fluid plants
- **ACUSCOMP™**
  Non linear Dynamic Analysis of reciprocating compressors and piping
- **COMPSYS™**
  Large compression systems
- **COMPSYS-MC™**
  Steam power systems
- **COMPSYS-MCwI™**
  GT ex. heat recovery by ORC
- **TGSIM-Plus™**
  Real-time gas Turbines simulator

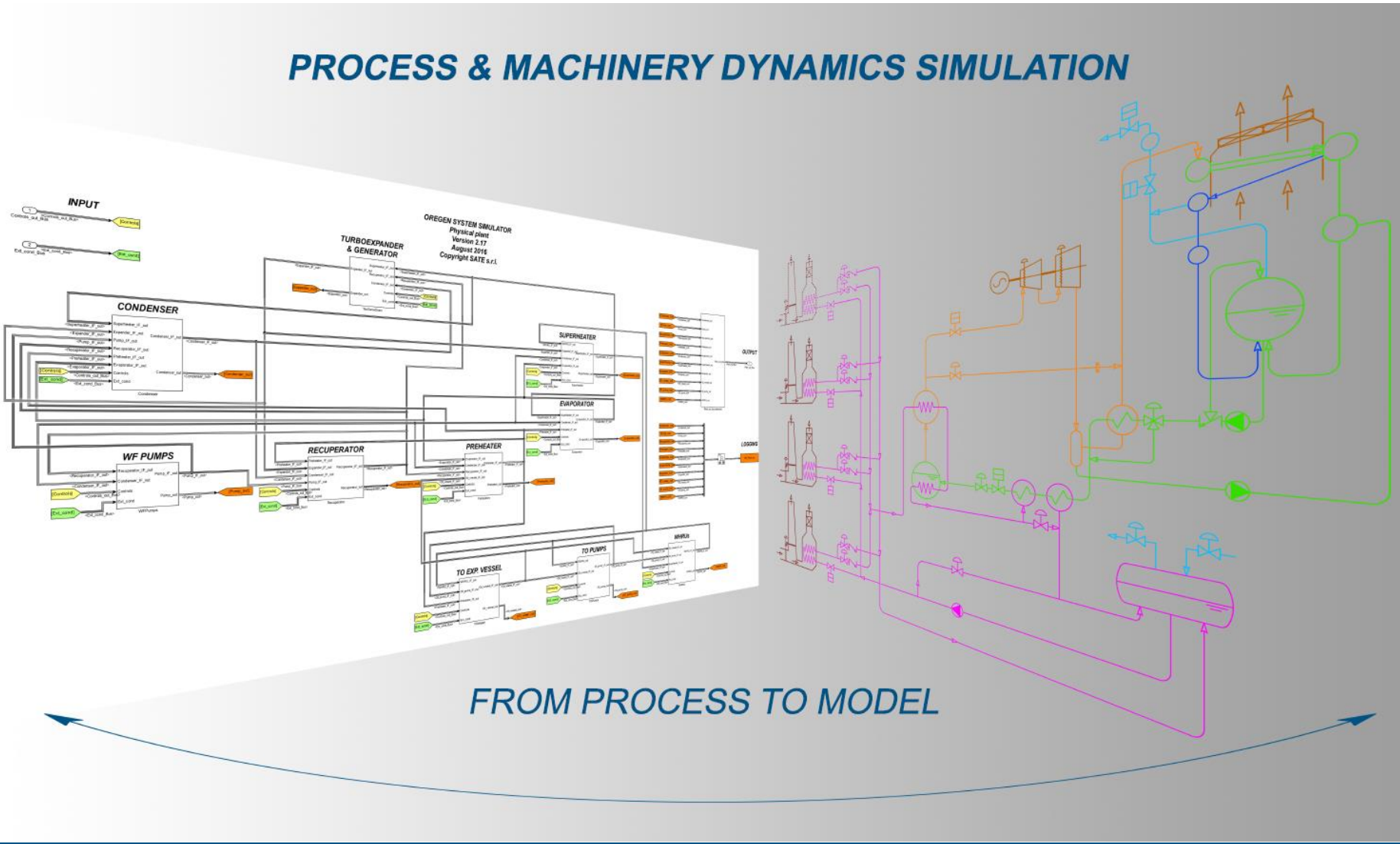
AUTOMOTIVE

- **MECHDYN™**
  Stationary and dynamic mechanical simulator
- **DRIVE**
  Vehicle & engine gear dynamics
- **BENCH**
  Dynamic simulator of car suspension test bench
- **CLUTCH**
  Dynamic mechanical-thermal simulator of the clutch system

SPACE

- **TELESCOPE DYNAMIC SIMULATION**
  Considering wind effects, bearing friction, sensors, controllers

Simulation services - Large scale models



Large compression systems

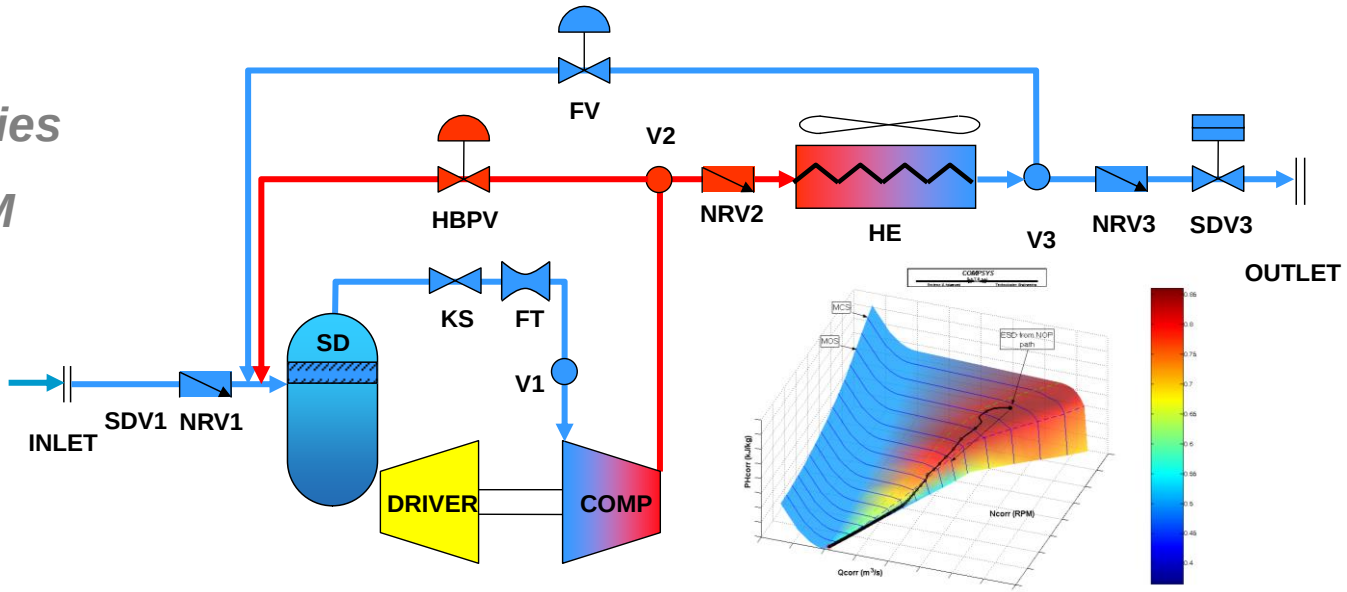
COMPSYS™:

Fluid process, machinery performance & control simulation

Clients:

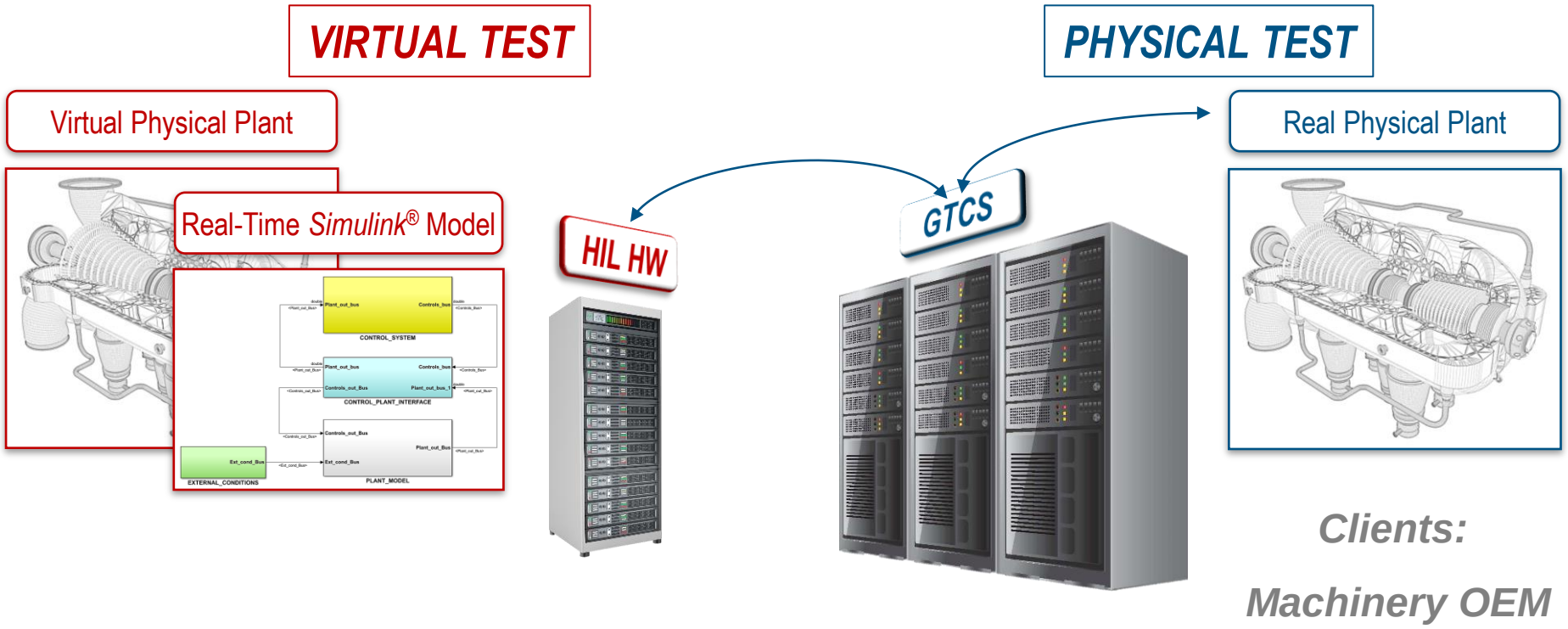
Oil&Gas companies

Machinery OEM



Simulation services for large processes & machines

TGSim Plus™ – Dynamic simulation of a power generation Gas Turbine Plant by a Hardware in the Loop (HIL) real-time system



Clients:

Machinery OEM

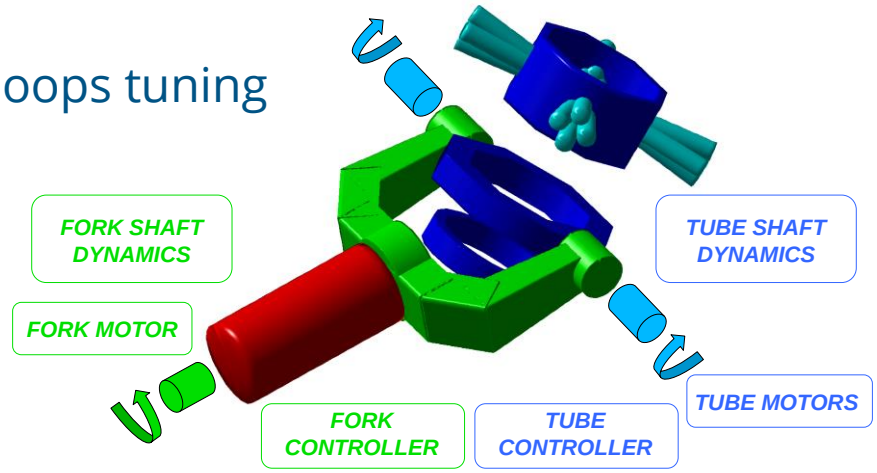
Simulation products for the space industry

NEOSTEL – Telescope dynamic simulation

1. Closed loop dynamic model considering:
   - wind disturbance
   - gravity effects
   - bearing friction model
   - sensors reading and processing lags
   - motors (AC brushless) model
   - elements intertias, masses and first modes frequency
2. Torque, speed and position control loops tuning

Client:

OHB CGS



DIAGNOSTICS & PROGNOSTICS

Model-based or Machine Learning based solutions by SATE proprietary methods

Diagnostic Kernel Modules for complex systems

AUTOMOTIVE

- **POWERTRAIN DIAGNOSTICS**
  On-board early fault detection and isolation for aftertreatment systems, fuel injection, air handling, turbocharger
- **SEW-AID™**
  Clutch, Gearshift and Alternator Diagnostic Models
- **ENDURANCE**
  Cooling and Lubricating Diagnostic Models

SPACE

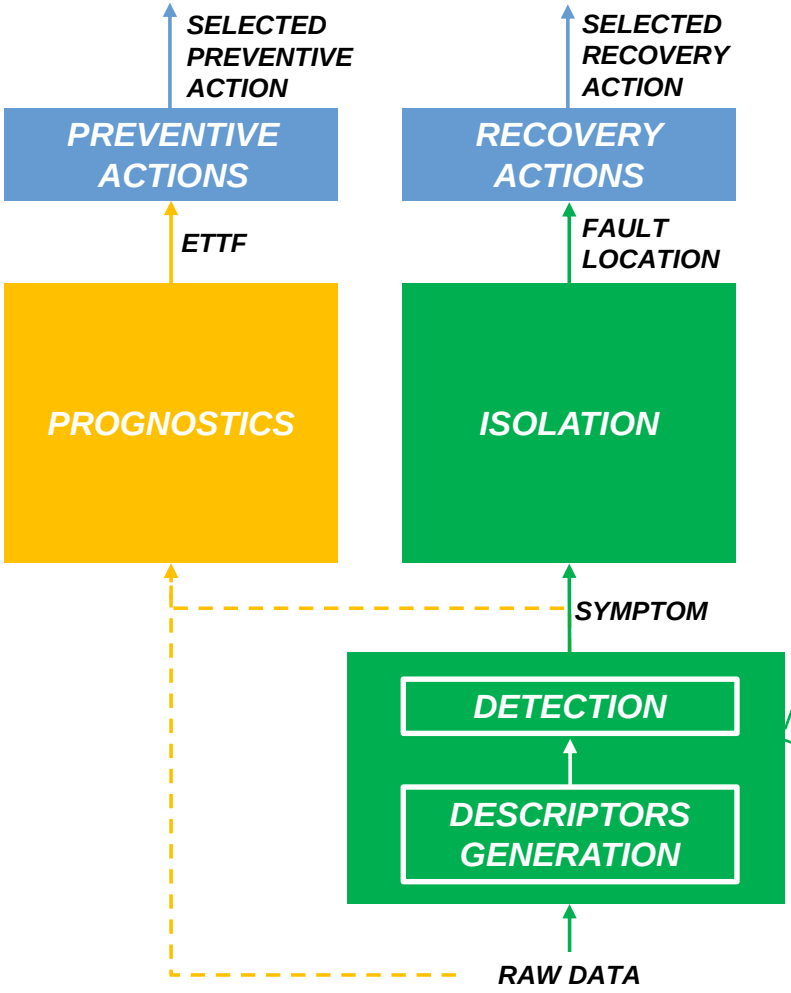
- **CASTeC™**
  Satellites constellations enhanced diagnostics on ground

ENERGY

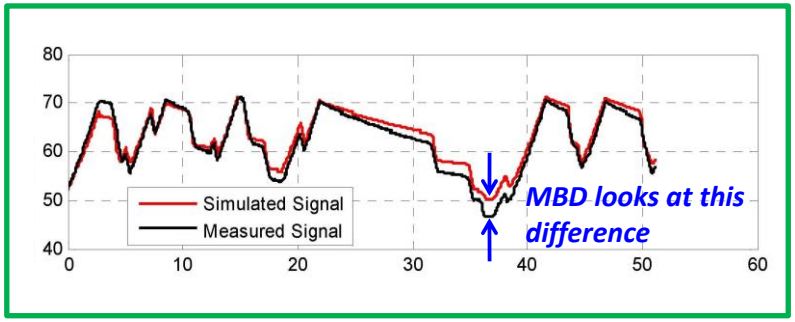
- **GAS PRODUCTION EQUIPMENT DIAGNOSTICS**
  Enhanced predictive diagnostics for process filters and booster seals
- **ICE - CSD & ASD**
  Internal combustion engine air and cooling system diagnostics

SATE DIAGNOSTIC KERNEL MODULES

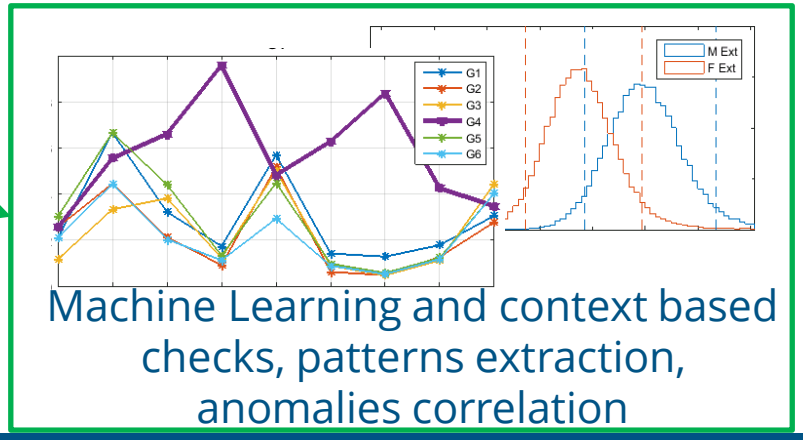
DKM



Model Based Diagnostics

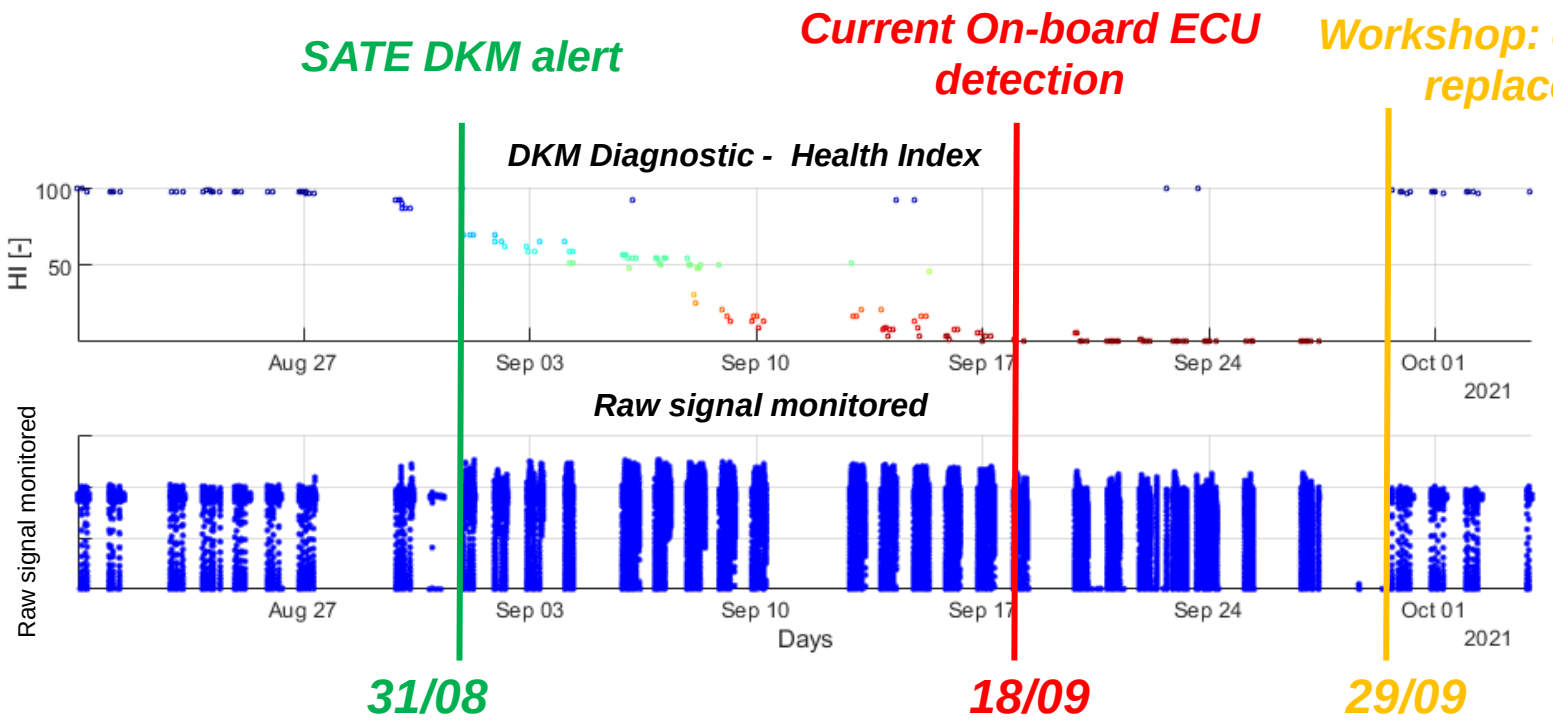


Data Driven Diagnostics



Diagnostic for the automotive industry

Early fault detection

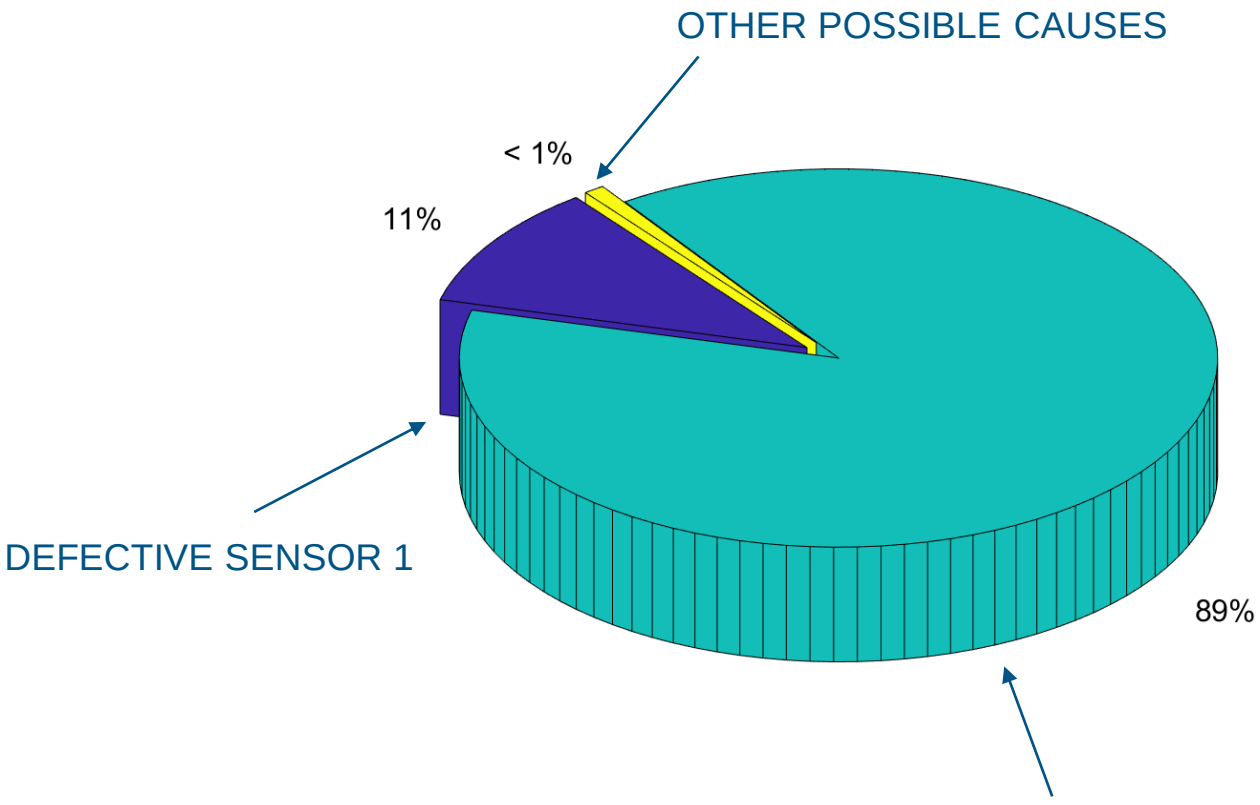


Client:

INTERNATIONAL OEM

Diagnostic for the automotive industry

Fault isolation



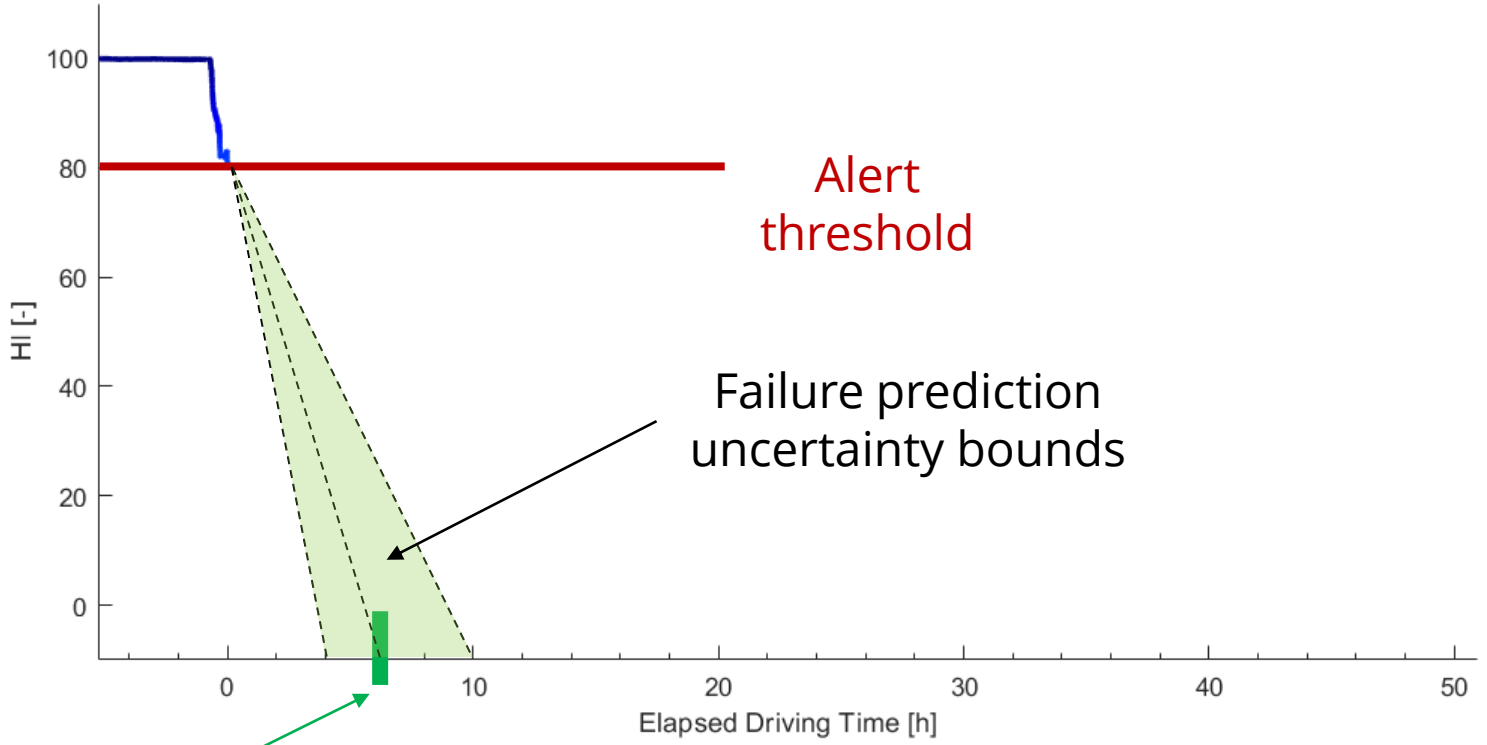
Client:

INTERNATIONAL OEM

Diagnostic for the automotive industry

Prognostics

DKM Health Index



Client:

INTERNATIONAL OEM

Diagnostic for the space industry

Cloud based service for enhanced constellation monitoring

BENEFITS

- ✓ Predictive capabilities
- ✓ Relevant information
- ✓ Events understanding
- ✓ No need for experts' knowledge

FEATURES

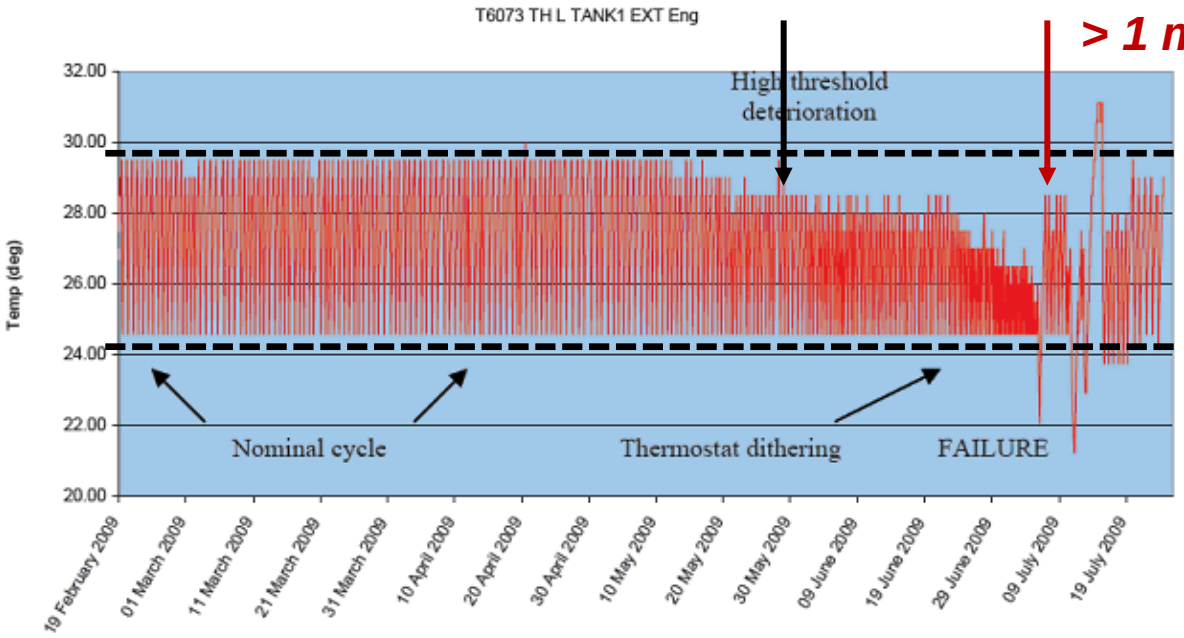
- ✓ SATE Innovative FETCH method
- ✓ Checkable features extraction
- ✓ Context-specific checks
- ✓ Interpretable AI

GSAW2022
CASTeC
Demo

Diagnostic for the space industry

Validated with four operative missions

XMM Example



End users' acknowledgements:

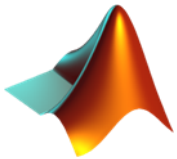
*CASTeC enables the **early detection of the events of different fault modes** through the analysis of data that were not previously used by the operators to investigate such events.*

*CASTeC **extracted new knowledge useful to operators** and **identified new (unknown) correlations**, which are necessary to understand the events occurred.*

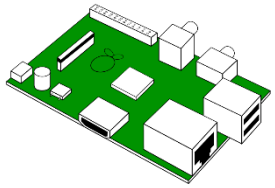
Software deployment

Mathematical models and diagnostic algorithms are deployed to server and embedded environments.

SERVER – DLL



EMBEDDED – LIB



Big data, server side application.
E. g. Predictive algorithms

High data rate, single system.
E.g. Online health index calculation

SATE Technologies tested in real drive conditions

Off-the-Shelf electronics

La guida e la matematica

Nei grafici qui pubblicati non solo vediamo come si evolvono nel tempo i vari parametri (i giri al minuto del motore, la velocità, l'accelerazione, la posizione dell'acceleratore...), ma possiamo anche riconoscere in che punto della pista questo è avvenuto. Per esempio si può sapere dove si è chiuso il gas, dove si è iniziato a curvare e dove si è raggiunto il massimo angolo di piega. Fin qui non ci sono novità rispetto ad un sistema di acquisizione dati professionale: parte di queste informazioni sono fornite dalla sensoristica di bordo, altre sono calcolate, e tutte sono poi memorizzate abbinandole al punto GPS.

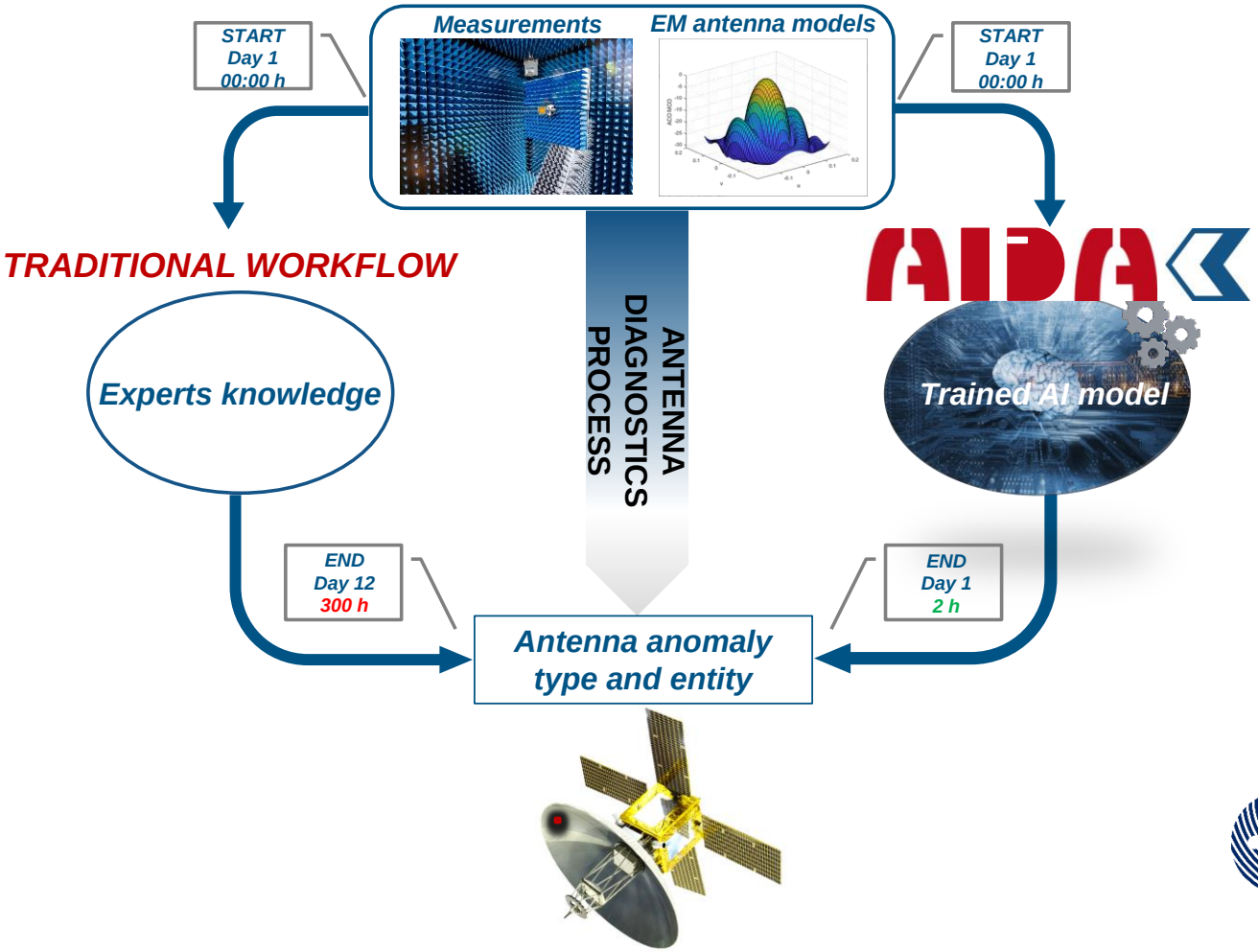
Ecco una chicca introdotta dal sistema Sate, che ci fa comprendere le potenzialità del

Custom made SATE Gateway

DATA MINING

Data investigation for the extraction of new engineering knowledge

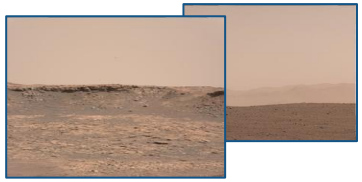
AIDA – Artificial Intelligence assisted anomaly detection and diagnostics



Client:

European Space Agency

APP4AD – AI based onboard novelty detection for rover planetary exploration



Wide-field acquisition

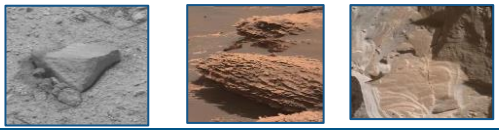
Scene classification & object detection

Mission identification

Scientific mission

Priority

Narrow-field acquisition



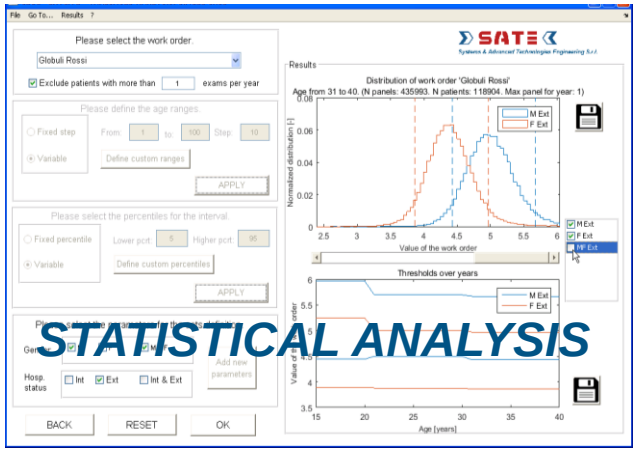
Navigation mission

Next acquisition

Client:

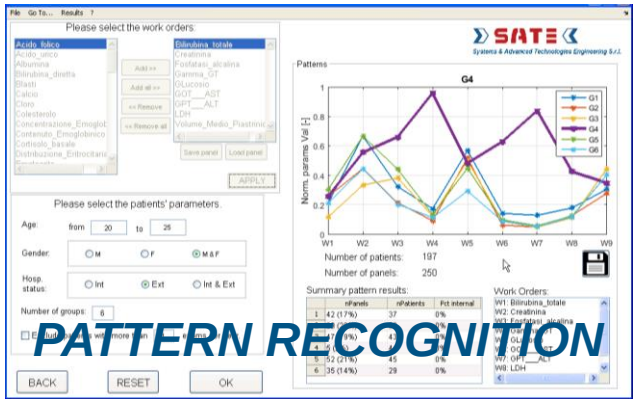
Agenzia Spaziale Italiana

CLUE for astronauts' medical autonomy



Statistical analysis

Provides both **qualitative** and **quantitative** analysis of the distribution of each work order



Pattern recognition

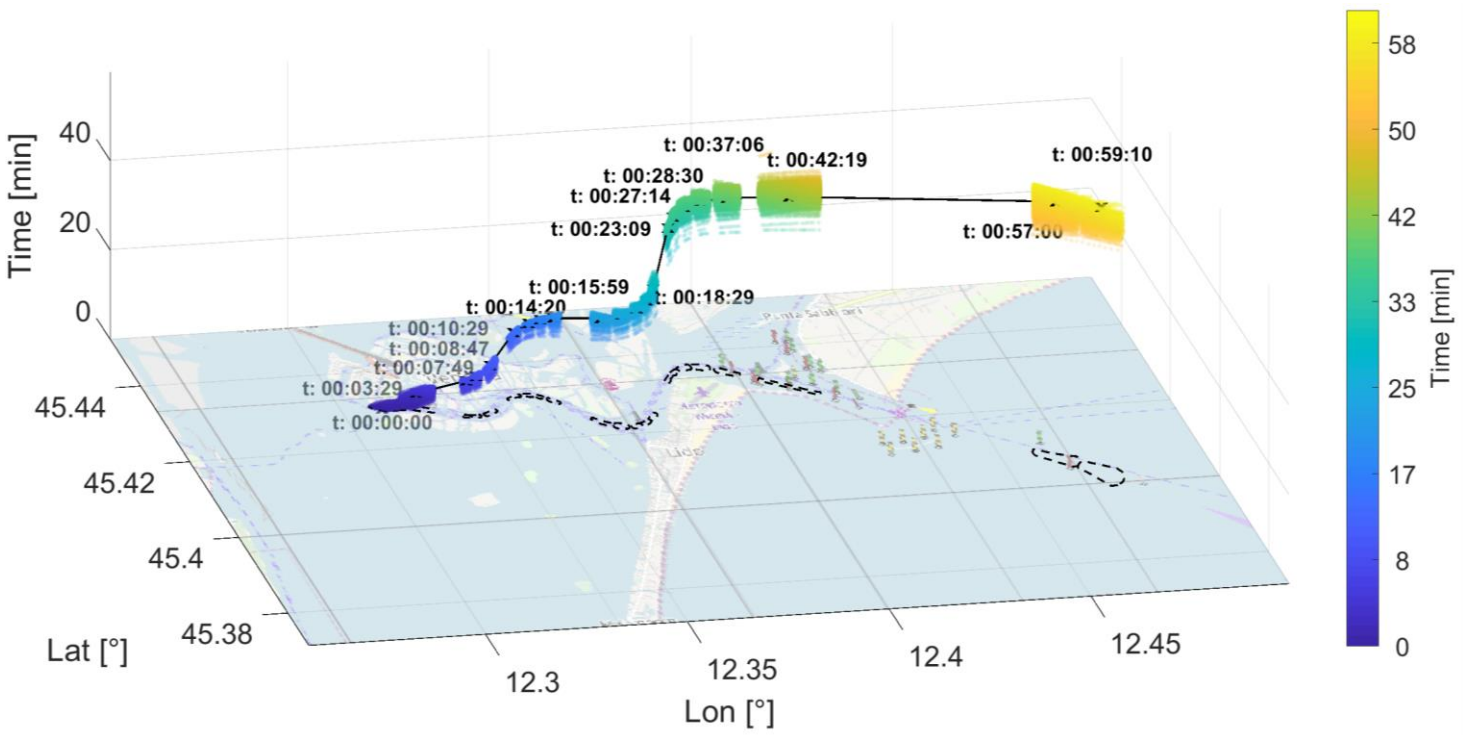
Allows the detection of meaningful groups among data using an unsupervised approach.

Client:

European Space Agency

TRA-Miner for ships routes extraction and monitoring

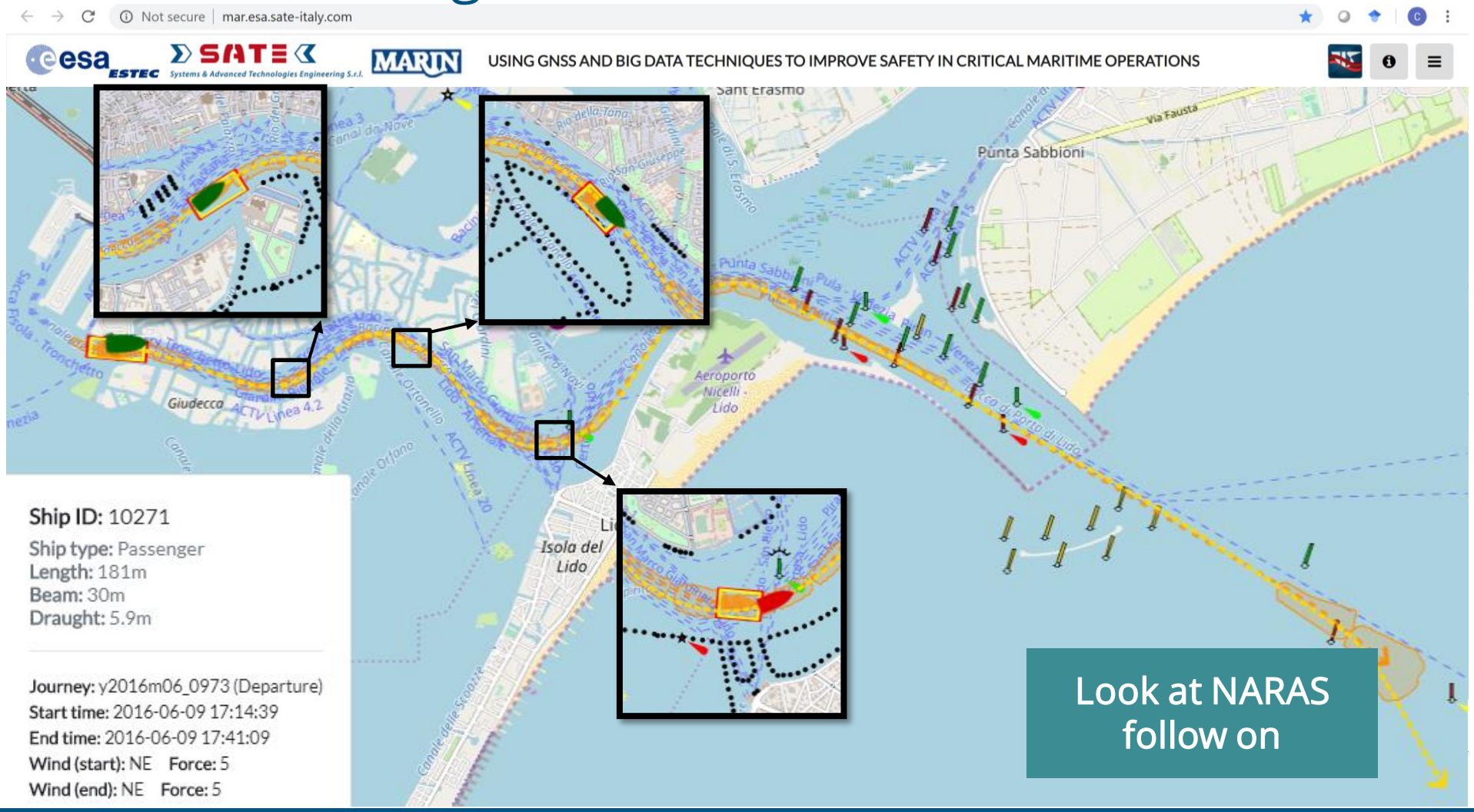
Big data methods and software tools that **extract recommended routes** from historical GNSS data to improve navigation risks in view of autonomous shipping scenarios.



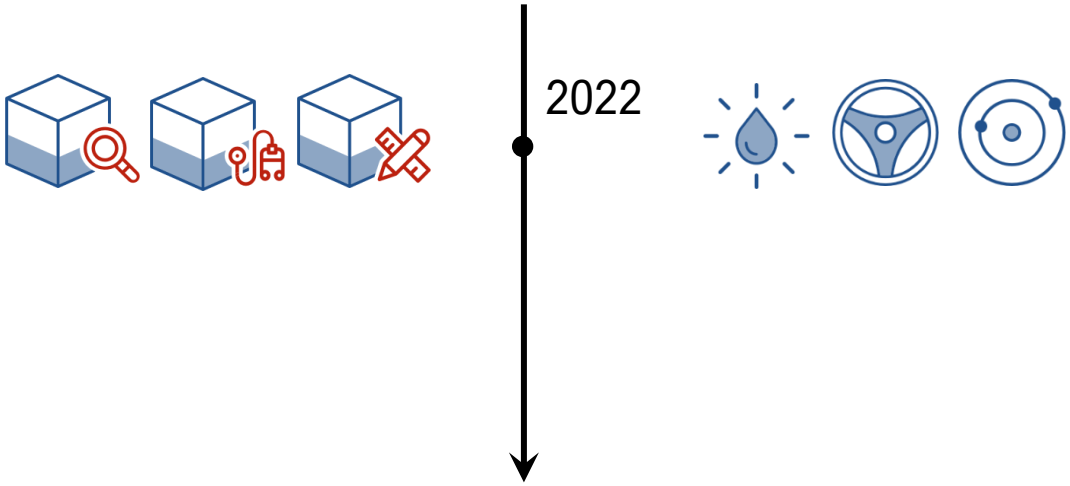
Client:

European Space Agency

TRA-Miner for ships routes extraction and monitoring



Looking at the future...



WHAT'S NEXT CHALLENGE?

Contact us!
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