What makes us different? Highly detailed knowledge of physical problems applied to the railway industry, the unique experience of our teams, and our commitment to always check our calculations against physical tests.

Arcangelo Schena
Founder of CIMES

Get real.

Our teams specialise in the railway industry and offer high-end services based on numerical simulations combined with testing. Supported by cutting-edge research, more than 25 years of experience, and complete proficiency in testing under real-world conditions, we offer engineers and designers in the rail sector unique tools to get their innovations to market faster.

- 25 engineers
- 25 years of experience
- 256-core HPC computing cluster
- 300 projects completed in the railway industry

Our tools
- Meshing: Hypermesh / PATRAN / SIMLAB / DesignSpace
- Multiphysics solvers: ANSYS / NASTRAN / OS Solver / Radioss / Abaqus / LS Dyna
- Topological and Topographical optimisation: Optistruct / ANSYS
- CFD: ANSYS Fluent / STAR-CCM+ / Open Foam / Acusolve / LS Dyna
- Multibody simulation: SIMPACK / Motionsolve
- Specific software: COBRA / SAFE LIFE DESIGN (SLD)
Diverse experience

Though it specialises in the railway industry, CIMES also works in the fields of mechanical engineering, automobiles, road transport, aeronautics, energy, civil engineering, biomedicine, heavy industry, etc. This diversity is a critical source of innovation and creativity that regularly adds to our base of knowledge.

Our fast, accurate, and responsive numerical simulations can be tailored to all modern railway engineering problems: sizing, testing, characterising, validation, and type approval. Our experts and engineers have a full range of software and HPC capabilities that can carry out even the most demanding calculations. They are constantly developing tools specifically for the needs of the railway industry, particularly in simulating complex and multibody systems.

Flexible expert services to gain a competitive edge

- Developing studies, simulations, and calculations
- Test platform engineering
- Software and business solution development
- Training
- Inspections
Capacity, speed, safety, comfort, connectivity, energy efficiency: everyone involved in the rail industry is developing their innovation capabilities in order to improve their performance and fulfill the needs of the market. Numerical simulations provide fast, flexible, and accurate answers to these engineering challenges, in every sector of the industry: rolling stock, intermodal solutions, freight, and infrastructure. Our pioneering numerical simulation teams have developed their skills by working with the most exacting and innovative clients in the rail industry.

"Our teams today are among the most experienced in the market. This allows us to work quickly and responsively at every stage of engineering without having to sacrifice quality or expertise."

Stéphane Vanhaesebroucke
Engineer - Project Manager

Comprehensive simulation expertise

Thermal and CFD
Thermo-mechanical, Fluid coupling structure

Acoustic and Vibration
Internal and external

Multibody Analysis
Rigid/flexible body coupled & biomechanics

Crash-Impact-SPH
Fluid coupling structure

Fatigue Design
S-N curves, Random Vibrations, Multiaxial

Pre-engineering & light-weight design
Static and modal analyses

Multi-criteria Optimization
industry. They draw upon unique expertise that can be seen in the quality of their simulations, the technological advancement of their software solutions, and the accuracy of their calculations, confirmed by years of testing.

CIMES’ teams can offer a flexible, complete line of services, including engineering, technical support, inspections, training, and software solution development, that can suit any type of organisation or process, whether for manufacturers, parts makers, or infrastructure operators.

Our goal is to provide them with global solutions in order to bring about ever-better products, every time.
"Ensuring security and safety, increasing permissible loads and transport capacities, improving passenger services and comfort, increasing the maintainability of the rolling stock, facilitating validation and type approval, reducing carbon footprints and improving energy efficiency, and extending the lifespan of rolling stock: our expertise addresses all major issues in the railway industry."

Catherine Helle
Business Developer

Passenger Rolling Stock

Having worked alongside international manufacturers and parts makers for more than 25 years, our teams have developed unique skills and knowledge centred on engineering and simulating rolling stock, including their mechanics, CFD, thermal and acoustic properties, and vibration phenomena.

CIMES’ numerical simulation capabilities, which are validated by numerous physical measurements, are very effective at accelerating development cycles and improving technical, economic, and ecological performance.

CIMES models, simulates, and tests all components and subsystems: cars, motors, interiors, bogies, axles, electrical and electronic systems, toilet modules, doors, etc.

Main customers
Preliminary design and lightweight design
- Searching for innovative structural concepts.
- Multimaterial vehicles: steel, aluminium, composites
- Welded, riveted, bolted, or adhesive assembly
- Model automation

Project studies - general studies
- Retrieval of 3D CAD geometries
- 2D and 3D modelling
- Meshing and set up model with general contact
- Structural calculations:
  - Static / Dynamic / Crash / Docking / Fatigue

Railway dynamics with multibody studies
- Dynamic behaviour
- Safety, track fatigue, ride quality
- Passenger comfort

CFD - External aerodynamics, heat exchanges
- External aerodynamics
- Air flow and thermal studies of equipment on roof and on under the vehicle
- Thermal studies of electrical equipment
- Fire engineering:
  - Simulation of fire on railbound vehicles
- Acoustics - Air flow, thermal comfort, and interior acoustic comfort

Testing
- Creating test specifications
- Creating gauge lines
- Designing test set-ups
- Test monitoring
- Correlation between tests and calculations

Standards
- Structural requirements of railway vehicle bodies
  EN 12663-1
- Measurement of noise emitted by railbound vehicles
  ISO 3095
- Fire Engineering
  NF EN 50553
- Railway dynamics and ride comfort
  UIC 518, NF EN 12299
- Interiors
  EN 12663-1 UIC leaflet 566
- Seats
  NF F 31-119
- On-board equipment
  CEI 61373
- Track equipment
  NF EN 50125-3
- Bogies
  NF EN 13749, NF EN 14536-6, NF EN 15437-1, ERR1 B12/ RP17, Eurocodes, DVS or BS, IEC 61 373
- Wheels and axles
  NF EN 13979-1, NF EN 13.979-2, NF EN 13.103, NF EN 13.104, UIC leaflet 510-2
- Screw and weld connections
  NF E 25-030-1, Eurocodes 3 & 9

Carbody shells

Interiors and seats

Cubicles and electrical components

Bogies and wheelset

Wind tunnel - University of Valenciennes and Hainaut-Cambrésis
"Our simulations provide new instances of innovation every day, resulting in improved performance. Looking at the restrictions imposed by intermodal links to air, sea, and road transport from an early stage is a heavy boost to the added value of the new models that our clients offer."

Frédéric CHUPIN
Engineer - Project Manager

Freight and intermodal transport

Though long neglected in terms of innovation, rail freight and its connections with other modes of transport represent a vast area for improvements in technical performance. Our expertise in comprehensive simulations and test engineering gives players in this sector accurate and reliable tools for developing and calibrating products and services that are superior in terms of their capacity, maintenance, intermodal links, connectivity, and sustainability.

Our services are supported by thorough knowledge of the physical, technical, and regulatory constraints of freight. These services provide our clients with effective expert guidance, which result in noticeable increases in competitiveness and profitability.

Main customers
Preliminary design and lightweight design
- Searching for innovative structural concepts.
- Multimaterial vehicles: steel, aluminium, composites
- Welded, riveted, bolted, or adhesive assembly
- Model automation

Project studies - general studies
- Retrieval of 3D CAD geometries
- 2D and 3D modelling
- Meshing and set up model with general contact
- Structural calculations: Static / Dynamic / Crash / Docking / Fatigue

Railway dynamics with multibody studies
- Dynamic behaviour
- Safety, track fatigue, ride quality
- Track twists (B55) or construction-distorted tracks

CFD - External aerodynamics, heat exchanges
- External aerodynamics
- Determining aerodynamic forces on transported vehicles
- Thermal studies and deflector studies
- Fire engineering: Simulation of fire on railbound vehicles
- Acoustics and vibrations - noise while passing and aeroacoustics

Testing
- Creating test specifications
- Creating gauge lines
- Designing test set-ups
- Test monitoring
- Correlation between tests and calculations

Standards
- Structural requirements of railway vehicle bodies
  EN 12663-2
- Measurement of noise emitted by railbound vehicles
  ISO 3095
- Fire Engineering
  NF EN 50553
- Railway dynamics and ride comfort
  UIC 518, NF EN 12299
- On-board equipment
  CEI 61373
- Track equipment
  NF EN 50125-3

Bogies
- NF EN 13749, NF EN 14536-6, NF EN 15437-1, ERRI B12/ RP17, Eurocodes, DVS or BS, IEC 61373

Wheels and axles
- NF EN 13979-1, NF EN 13979-2, NF EN 13,103, NF EN 13,104, UIC leaflet 510-2

Screw and weld connections
- NF E 25-030-1, Eurocodes 3 & 9

Tanker wagons
Hopper wagons
Automobile transport wagon
Service wagons
Intermodal wagons
"More responsive, more durable, safer: optimising the performance of railway infrastructure today requires a broad base of complementary technologies. In this sector, our strength lies in our proficiency with comprehensive multibody simulations of complex systems involving rolling stock, tracks, and metal or concrete structures."

Arnaud Ringeval
Engineer - Project manager

Infrastructures

Engineering railway infrastructure takes a great deal of investment and resources, so it represents a major source of cost reductions. Numerical simulation makes it possible to develop and validate optimisations, resulting in substantial economic savings: minimal thickness, lower fatigue and wear on rails and tracks, easier maintenance, etc. These simulations also help ensure that carriers enjoy the levels of vibration and acoustic comfort that regulations and the market both demand. Finally, they are an essential tool for ensuring safety during transport, and make it possible to safely add new technologies to optimise track capacity.

Main customers
Preliminary design and lightweight design

- Looking for innovative structural concepts for fixed installations
- Welded, riveted, bolted, or adhesive assembly
- Model automation

Project studies - general studies

- Retrieval of 3D CAD geometries
- 2D and 3D modelling
- Meshing and set up model with general contact
- Structural calculations: Static / Dynamic / Crash / Docking / Fatigue

Railway dynamics with multibody studies

- Determining force on tracks
- Safety, track fatigue, ride quality
- Track twists (B55) or construction-distorted tracks
- Pantograph and overhead wire interaction

CFD - External aerodynamics, heat exchanges

- External aerodynamics and aeroacoustics
- Determining aerodynamic forces on transported vehicles
- Effects of passing trains through tunnels
- Noise mapping and noise while passing
- Fire engineering: fire simulation in tunnels
- Acoustics and vibrations - mitigation of acoustic and vibrational nuisances

Testing

- Creating test specifications
- Creating gauge lines
- Designing test set-ups
- Test monitoring
- Correlation between tests and calculations

Standards

- Sizing fixed structures Eurocodes and DAN
- Measurement of noise emitted by railbound vehicles ISO 3095
- Fire Engineering NF EN 50553
- Railway dynamics and ride comfort UIC 518, NF EN 12299
- Track equipment NF EN 50125-3
- Screw and weld connections NF E 25-030-1, Eurocodes 3 & 9
CIMES is one of the most experienced numerical simulation and test engineering teams in the railway industry today. We help designers and manufacturers of rolling stock and infrastructure improve and validate the performance of their projects and products, with the best possible accuracy.