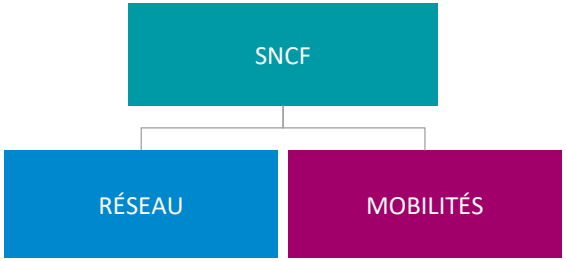
AUTONOMOUS TRAINS IN AN OPEN ENVIRONMENT

Collaboration between developer and railway safety authority for a successful project

HOW FRENCH RAILWAYS ARE ORGANISED



INFRASTRUCTURE MANAGER

~ 30,000 km

~ 15,000 trains/day

RAILWAY UNDERTAKING

Legacy publlic-sector operator

~ 5 million passengers/day

~18 G TK

National Safety Authority

~100 employees

AUTONOMOUS TRAIN PROGRAMME

PROGRAMME LAUNCH

2016

Staffing

Definition of work

R&D PROJECTS

2017/2023

4 collaboratives projects:

- Railway remote control
- Obstacle and trackside signal detection
- 2 « GoA4 » prototypes

INDUSTRIAL DEVELOPMENT

2023/2025

Draft of specifications

Call for tenders

Orders

OPERATION

2025

Challenges:

From GoA 1 to 4

Incremental development

Euro compliant

Conformity with all European standards

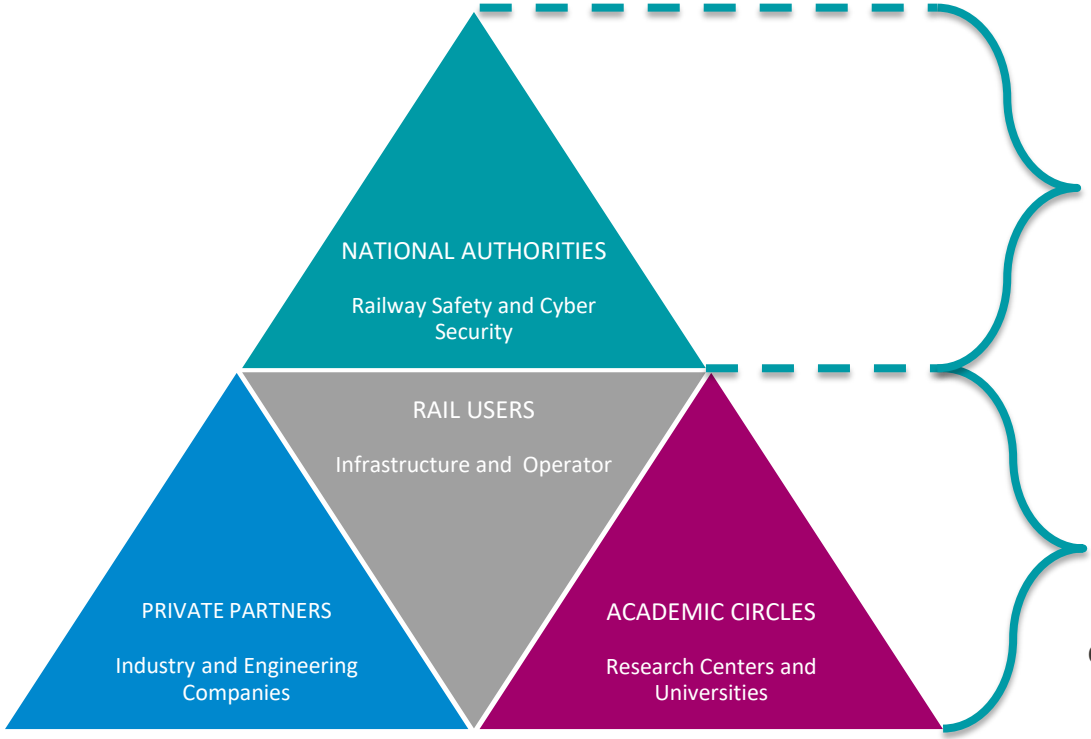
Transition compliant

Ability to funtion on existing rail system

Train-borne

No changes to the infrastructure and no new infrastructure products

STAKEHOLDERS



Committed to the consortiums:

Signature of a letter with no contractual obligations

Members of consortiums:

On the basis of a contract setting out financial and results obligations

COLLABORATION WITH THE SAFETY AUTHORITY

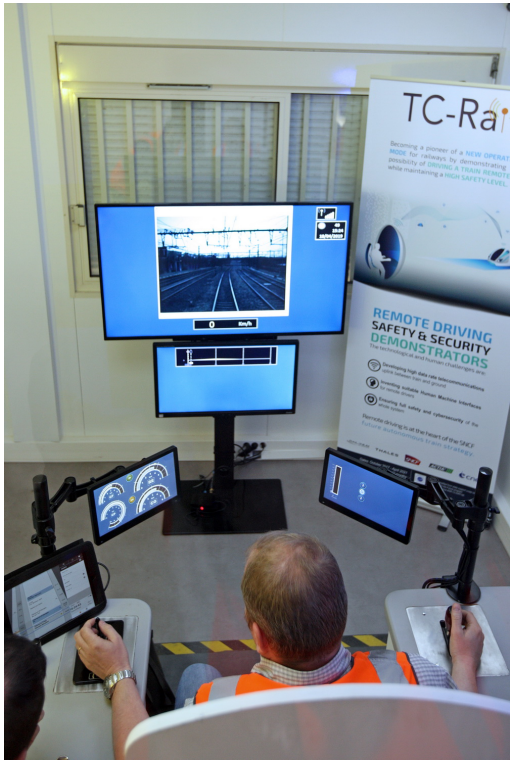
Main goals

1. SAFETY BY DESIGN
2. DEFINITION OF STANDARDS AND ADAPTATION OF REGULATIONS
3. NEW SAFETY DEMONSTRATION METHODS

MAINTAINING NEUTRALITY

TC-RAIL: AN EXAMPLE OF COLLABORATION

Project for developing a remote-driven train prototype



TODAY'S MAIN CHALLENGES

Qualification

Quality of assessments made of the reliability of the functions performed by drivers:

+ Quality of perception?
+ Events avoided?
+ Compliance with existing rules (AI…)?
+ …

Affordability

Acceptable trade-offs between safety and affordability in order to design systems that are both safe and economically viable:

+ Long distance collision detection?
+ Communication level?
+ …

Transfer of requirements

Driving functions can be transferred:

+ To infrastructure (e.g.: environment monitoring)?
+ To traffic control (e.g. departure orders)?
+ GOA1 vs GOA4 coexistence ?
+ …

Validation methods

Innovative validation methods:

+ Formal methods?
+ Digital simulation?
+ …