Innovative light train

WEBIRAIL

22/11/2023

TELLI

Mobility back on track

SNCF THALES Building a future we can all trust TEXELIS CAF RAILENIUM RAIL RESEARCH & INNOVATION Wabtec CORPORATION ALSTOM FERROCAMPUS NOUVELLE-AQUITAINE Capgemini Cerema EKTACOM L'EXPERTISE VIDÉO MARITIME

SNCF AS ARCHITECT AND PROJECT COORDINATOR

Jacques BERLING
Project Director - innovative Light Train

This train, which is part of a whole new system, aims for a performance leap regarding regional lines as equally important as the breakthrough of TGV with long-distance services.

Project supported by ADEME as part of France 2030

INNOVATIVE LIGHT TRAIN

TELLI, TO FILL THE GAP IN THE CURRENT ROLLING STOCK MARKET

Helping the railway industry to offer a specific solution for regional lines

Current regional rolling stock (single deck)

Régiolis - 220 seats – 72 m

AGC – 160 seats – 58 m

The regional train from the end of the 20th century : diesel powered, with an end of life scheduled around 2030/2035

X73500 – 61 seats + 17 folding seats 29m

On catalogue (single deck)

ALSTOM ILINT
120 seats – 54 m

SIEMENS MIREO
120 seats – 52 m

CAF CIVITY
120 seats – 54 m

STADLER FLIRT AKKU
124 seats – 54 m

SCALABLE CAPACITY : REDUCING ACQUISITION AND OPERATING COSTS

TELLi US 80 seats, 30m

TELLi en UM3 – 240 seats, total capacity of 420 passengers

VIDÉO

INNOVATIVE LIGHT TRAIN

CHANGING THE ECONOMICS OF REGIONAL LINES WITH A RENEWED RAILWAY SYSTEM

TELLi, a full system trackside + on-board

A new and innovative train

Environmentally friendly : 0 emission target

Less expensive than the actual offer

The uniqueness of TELLi

Interoperable for a seamless service

A signaling blended into the main network

x2 Doubling the transport offer at constant cost !

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MOBILISATION OF THE FRENCH RAILWAY INDUSTRY

to build a frugal and modular railway system for Low Density Lines (LDL)

CONSORTIUM

11

PARTNERS

THALES – Building a future we can all trust
EKTACOM – L'EXPERTISE VIDÉO NUMÉRIQUE
TEXELIS
CAF
Cerema – CLIMAT & TERRITOIRES DE DEMAIN
SNCF
Wabtec CORPORATION
Capgemini
ALSTOM
RAILENIUM – RAIL RESEARCH & INNOVATION
FERROCAMPUS NOUVELLE-AQUITAINE

PROJECT TIMELINE

51

MONTHS

Phase 1
Studies
POC

Phase 2
Validation
Demonstration

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DISCOVERING OUR PARTNERS

Antoine MUGUET
CAF Group – Project Manager

As a train manufacturer, CAF will lead the development of a new lighter rolling-stock platform, including innovative carbody solutions as well as modular and flexible interiors. CAF will also ensure the integration of the innovations led by the other consortium partners and develop a highly efficient and carbon-free traction for non-electrified routes.

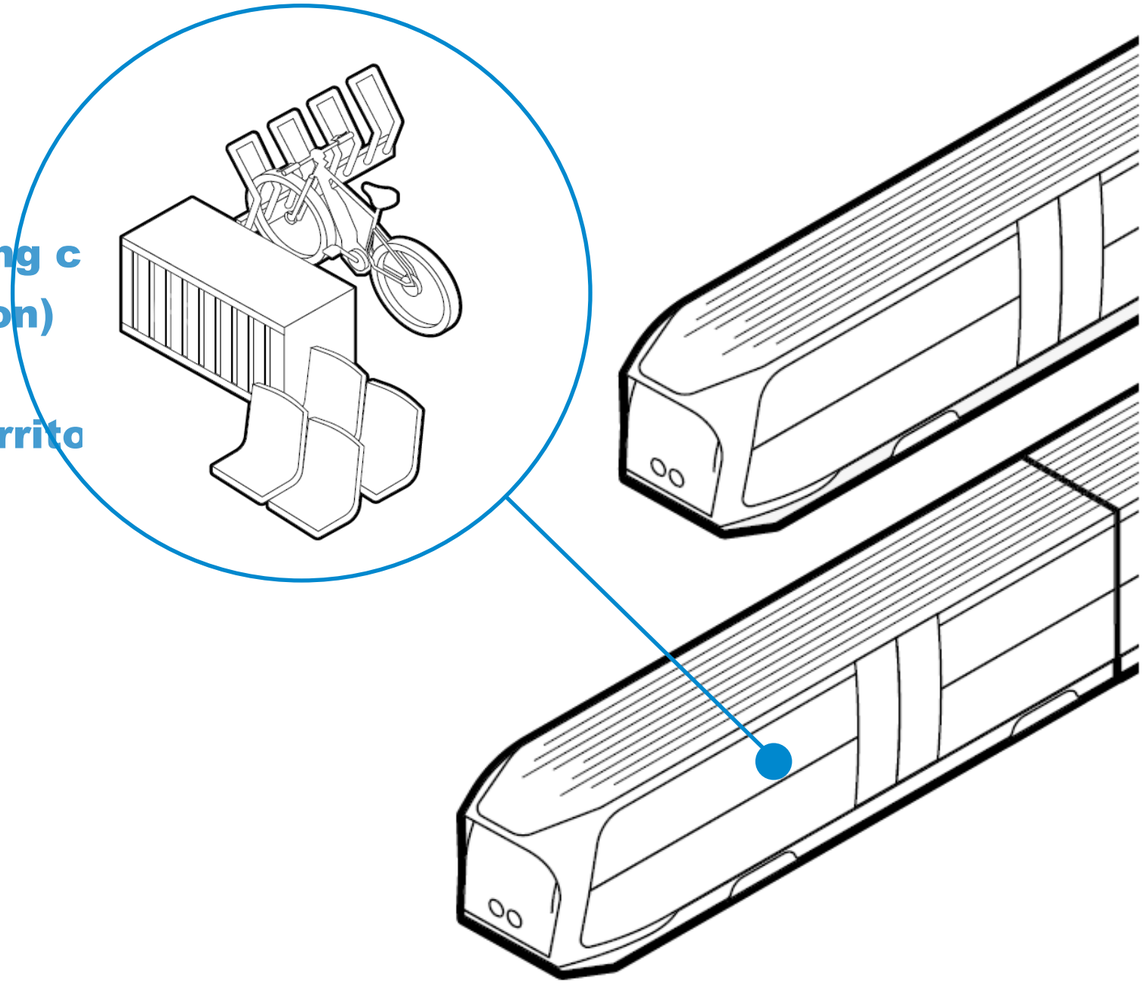
- Since more than a century, CAF - Construcciones y Auxiliar de Ferrocarriles - is an international leader for designing and building mobility solutions, rolling stock manufacturing and services provider in the railway industry
- Turnover of €3,16bn for 2022 (Backlog of €13,25bn)
- 14 000 employees around the world
- Industrial footprint in Spain, France, UK, USA, Brazil and Mexico
- Over 50 maintenance centers worldwide
- Over 130 projects in 40 countries valued at around €27bn

CAF CONTRIBUTION: PLATFORM, INTERIOR AND TRACTION

For platform, the purposes are to:

- **Design a light and cost optimised platform**
- **Integrate all the innovative sub-systems (single driving c independent wheels, autonomous driving and traction)**
- **Design a lighter carbodyshell with composite parts**
- **Design a modular interiors adapted to the different territo (passengers, micro-freight, track monitoring…)**

- **Validate the results by :**
  - A carbodyshell prototype manufacturing and static tests
  - A digital mock up
  - A physical mock-up 1:1 scale



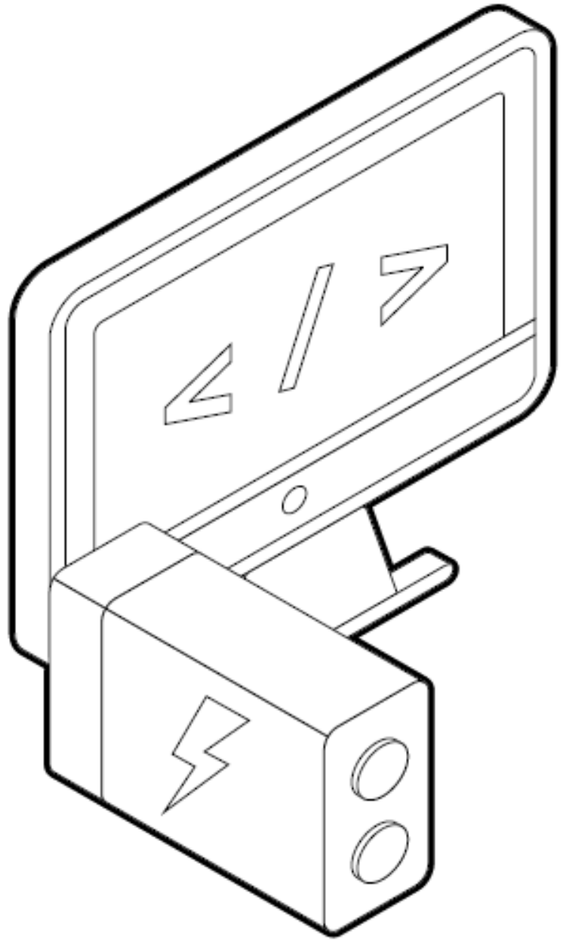
CAF CONTRIBUTION: PLATFORM, INTERIOR AND TRACTION

For the Traction, the purposes are to:

- **Design an innovative and highly efficient alternative propulsion system based on batteries offering up to 250km of autonomy for light regional train**
  - Optimised power architecture
  - Full SiC compact traction system
  - Latest battery technology

- **Study an hydrogen solution for larger range autonomy**

- **Validate the results with laboratory prototypes achieving a TRL5 in the following scenarios:**
  - HIL (hardware in the loop)
  - Power laboratory



DISCOVERING OUR PARTNERS

TEXELIS

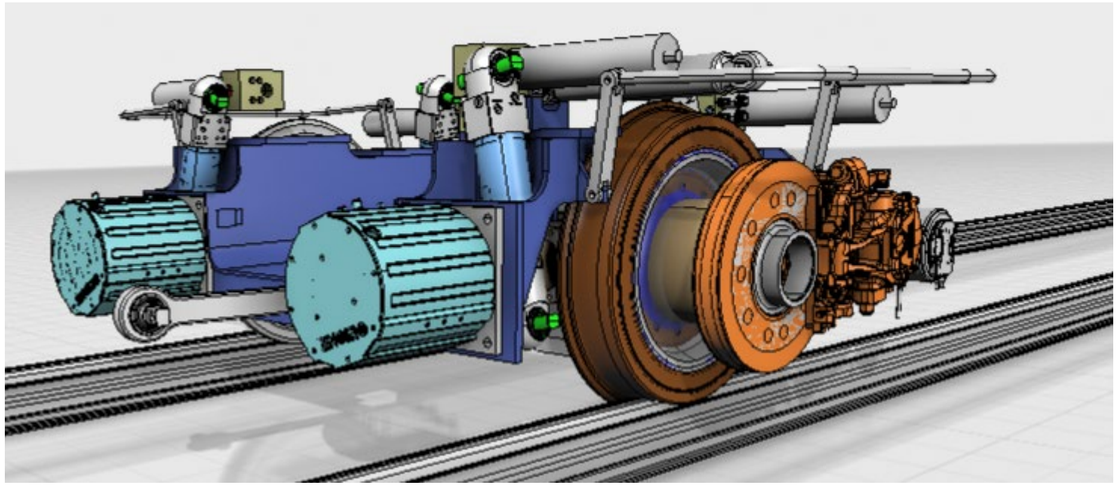
Axel DE GALEMBERT
Sales Director Transports

On this project, Texelis creates the cutting edge Ground connection in association with an eco-friendly motorised wheel, optimised for infrastructure re-use and passenger comfort.

- 40 years existence
- Design and production of axle, transmissions systems for military vehicles, metros, Trams, buses, Airport shuttles
- Key capacity : Traction Chain Experts - Conversion of power generated engine force into vehicle movement
- 300 staff members
- 35,000m² production facility in Limoges, France
- 2022 turnover EUR 88 Mlions
- References: Montreal Metro, Mexico Metro, Santiago Metro, Paris Metro and Tram, Marseille Metro, Lyon Metro and Trams, Lausanne Metro, Lille metros, as well as tram and APM systems around the world.

GROUND CONNECTION: THE KEY PLATFORM SUB-SYSTEM

1) Innovative concept focusing on reducing the infrastructure impact



- 2 Independent motor wheels on each axle
- 30% lighter than a classic bogie

2) Easy access for people on the train

- Leveling adaptation to the station platform
- Complete flat floor

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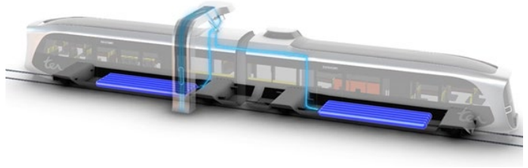
GROUND CONNECTION: THE KEY PLATFORM SUB-SYSTEM

3) Performance and advantages for the rolling stock…

+Maneuverability
+Speed
+Comfort
+Safety

Lighter Structure
Easier to maintain

+Space for innovative solutions (batteries, hydrogen...) and for passengers (seats, bikes, micro freight)



4) … and for infrastructures

Unused tracks brought back to life at low cost

Lower carbon impact on the rural world

Easier implementation of signalling and surveillance systems on rural tracks

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DISCOVERING OUR PARTNERS

ALSTOM

Benoit Gachet
Alstom – Product Director

LEADING THE WAY TO GREENER AND SMARTER MOBILITY, WORLDWIDE
Mobility is at the heart of everything we do – it's in our DNA.

With the broadest product portfolio in the rail industry, we are able to create mobility solutions that people enjoy riding – solutions that lead societies to a low carbon future.

>80K employees 63 countries >250 sites >22K engineers

Partner with >300 cities >10K patents

Alstom is the leading mobility solution provider in Europe and will bring his strong experience in several fields to support the development of an innovative solution for the French "Lignes de Desserte Fine du Territoire".

Based on the successful implementation of hydrogen solutions, Alstom will lead the solution of fuel-cell train offering 1 000 km of autonomy.

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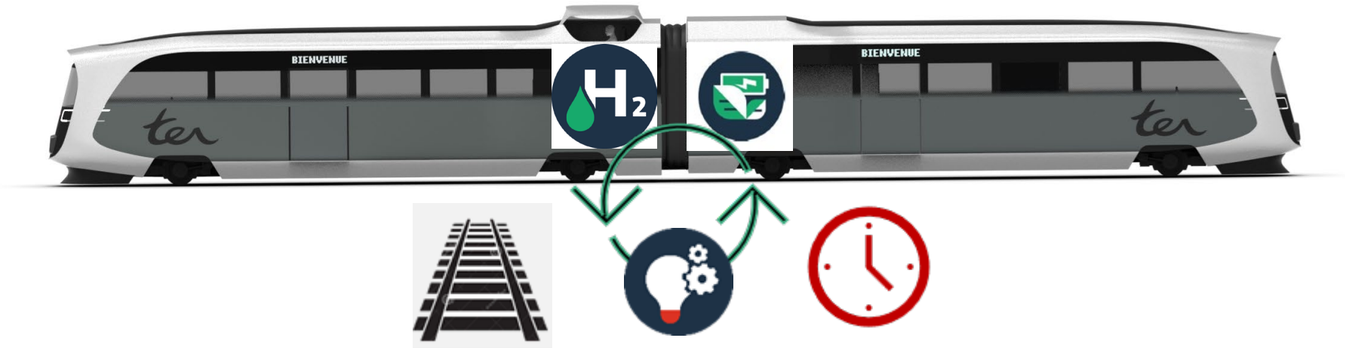
ALSTOM: OPTIMISATION OF HYDROGEN STORAGE AND CONSUMPTION

Hydrogen

Stored as gas in holding tanks on the roof, is the fuel used by the fuel cell.

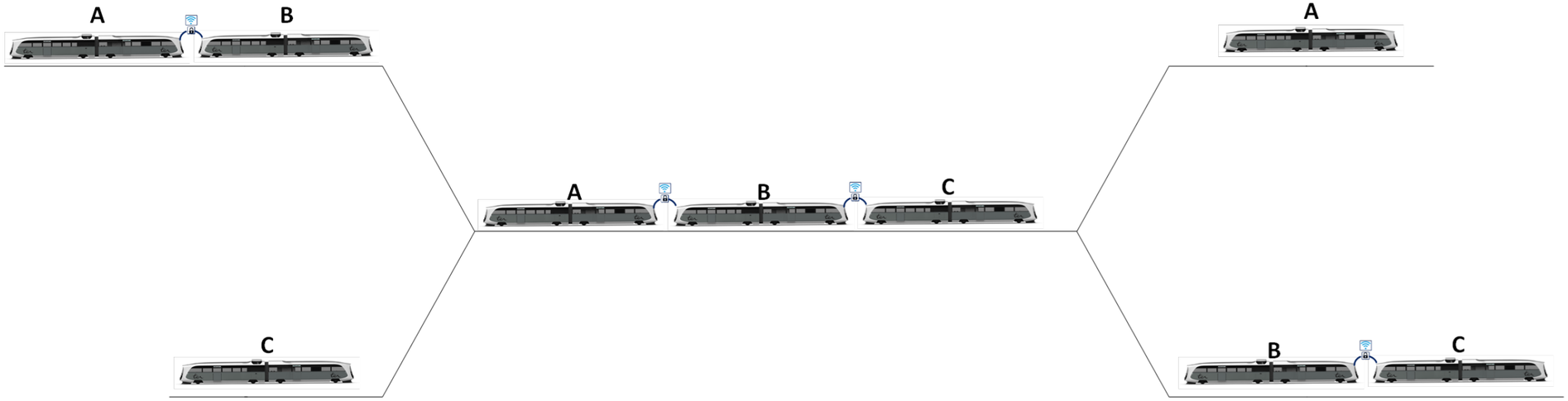
H2 storage:

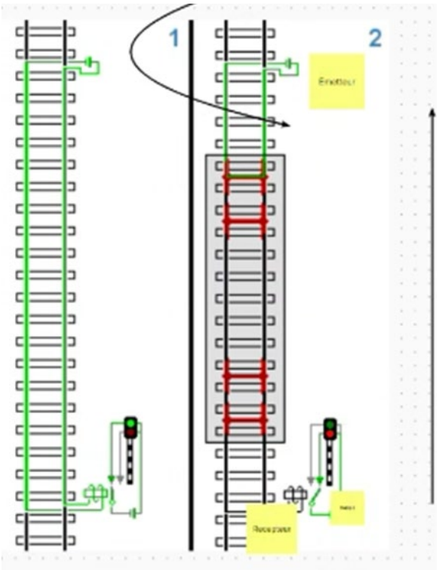
- 350bars
- 700bars
- Liquid



Alstom developed optimisation tools of energy storage for applications including train and environment.
Alstom scope is to define the algorithm with the TELLi architecture and constraints.

ALSTOM: VIRTUAL COUPLING & SHUNTING





The work to be carried out within the framework of virtual coupling aims to determine whether an alternative solution to traditional UM coupling is valuable.

Alstom's objective is to contribute its experience and analyze the feasibility study of a technical solution to avoid deshunting.

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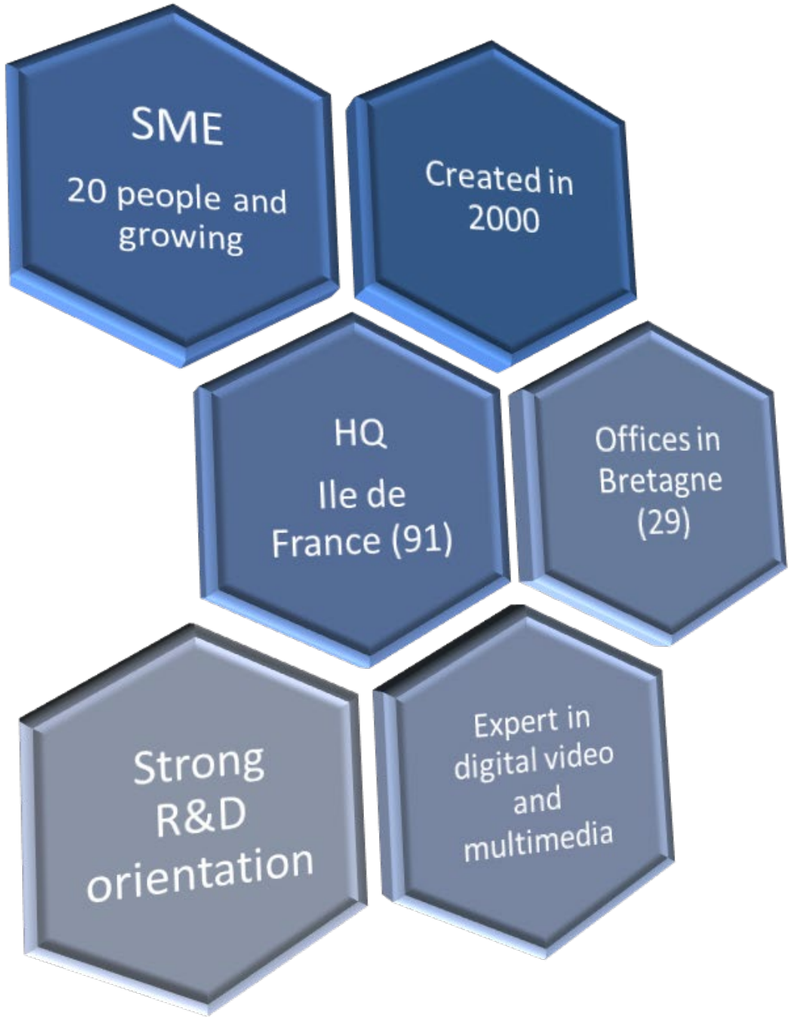
DISCOVERING OUR PARTNERS

EKTACOM
L'EXPERTISE VIDÉO NUMÉRIQUE

Marc LENY
Head of R&D Department



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DISCOVERING OUR PARTNERS

EKTACOM
L'EXPERTISE VIDÉO NUMÉRIQUE

Marc LENY
Head of R&D Department

SME
20 people and growing

Created in 2000

Disruptive adaptive video tech

Since 2013

HQ
Ile de France (91)

Offices in Bretagne (29)

Optimal video
3D audio
Metadata

Solution for Remote Driving

Strong R&D orientation

Expert in digital video and multimedia

Custom design

Projects:
TC-Rail
Shift2Rail
5G-Rail
TELLi

TELLi

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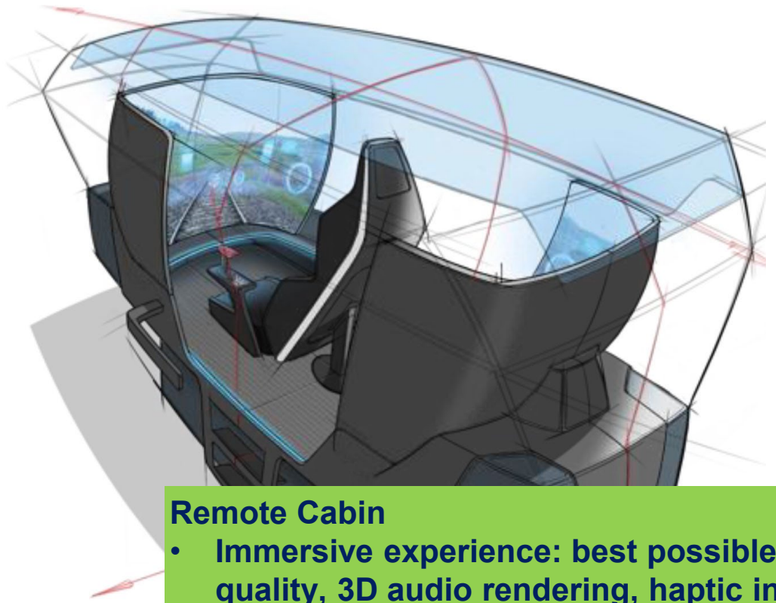
MAIN TECHNOLOGICAL LOCKS

Within TELLi,, two main focuses for EKTACOM:

- To provide the best possible immersion for Remote Train Driving, with adaptive video, 3D audio, metadata and tailored-made software of the ground cabin for the driver
- To imagine and develop a cutting-edge graphic environment for the digital cabin inside the train

Remote driving
- **Adaptive video from multiple cameras**
- **3D audio collection**
- **Metadatas : GPS, Inertial Measurment Unit, Weather ...**



Remote Cabin
- **Immersive experience: best possible video quality, 3D audio rendering, haptic interfaces ...**
- **Software development of the Cabin with potential simulation mode**

Digital cabin
- **Custom designed Graphic User Interface**

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DISCOVERING OUR PARTNERS

Balraj David
Chef de projet Train Léger Innovant

The Cerema, a public institution under the Ministry of Ecological Transition and Territorial Cohesion, supports the State and local authorities in the development, implementation, and evaluation of public policies for urban planning and transportation.

- Our goal is to contribute to the implementation of efficient, sustainable, and accessible mobility policies and services, tailored to the specificities of different regions and the needs of their populations.
- In the project, we aim to assess the viability of light rail systems, considering their social, economical, and political acceptability.
- We will also explore intermodality and exchange hubs for small rail lines.
- We will provide tools for territorial analysis and cost evaluation of development scenarios for these lines in comparison to their current situation. To do so, we will rely on case studies conducted in selected study areas to illustrate the diversity of small rail lines

- France: 2500 employees
  Headquarter in Bron
  32 sites across France

Our work on railways is available on our website:
https://www.cerema.fr/ferroviaire

A STRONG CONVICTION FROM CEREMA: THE IMPORTANCE OF AN AMBITIOUS SYSTEMIC VISION

Scope: selection of 93 commercial routes = 9,000 km of lines (LDFT Ligne de Desserte Fine du Territoire)

TER current situation		TER goal	Car
Average journey station to station	Best journey - station to station	Nominal journey - 1st approach	Average journey - including traffics jam
58 km/h 12 stops/100km	66 km/h 10 stops/100km	73 km/h 12 stops/100km	**69 km/h** Stops wherever you want
Average « frequency »		Target « frequency »	« Frequency »
8 round trips per day, approximately 1 round trip every 2 hours. No regular scheduling. Frequent lack of service for 4 hours		1/4h (RER/ urban) 1/2h (suburban) 1h (long line) 2h = exception	**Available at any time!**

How?

- Rethinking the organization of the railway system for small lines.
- Smart investing and sizing according to needs

INTRODUCTION

RAILENIUM
RAIL RESEARCH & INNOVATION

Bertrand MINARY
Chief Executive Officer Institute of Technological Research (IRT) RAILENIUM

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MAIN TECHNOLOGICAL LOCKS

proceeded by Railenium with TLi's partners

Remote driving
- **Ergonomics/adapted remote control panel**
- **Security (failed modes/scenarios/operating limits)**

Self-adaptive energy management based on equipment installed on board

Measurement system, sensors for rolling stock and infra structure monitoring

Digital cabin based on vision technology

Bogie-free system rail dynamics

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Thank you for your attention

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Mobility back on track

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