Université Gustave Eiffel

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LABORATOIRE ESTAS
ÉVALUATION DES SYSTÈMES
DE TRANSPORTS AUTOMATISÉS
ET DE LEUR SÉCURITÉ

CERTIFER
Groupe apave

Safety Analysis of Railway Signalling
European Train Control System (ETCS) Level 3

SAGIP école SED 12-14/03/2025

Araaf Recta

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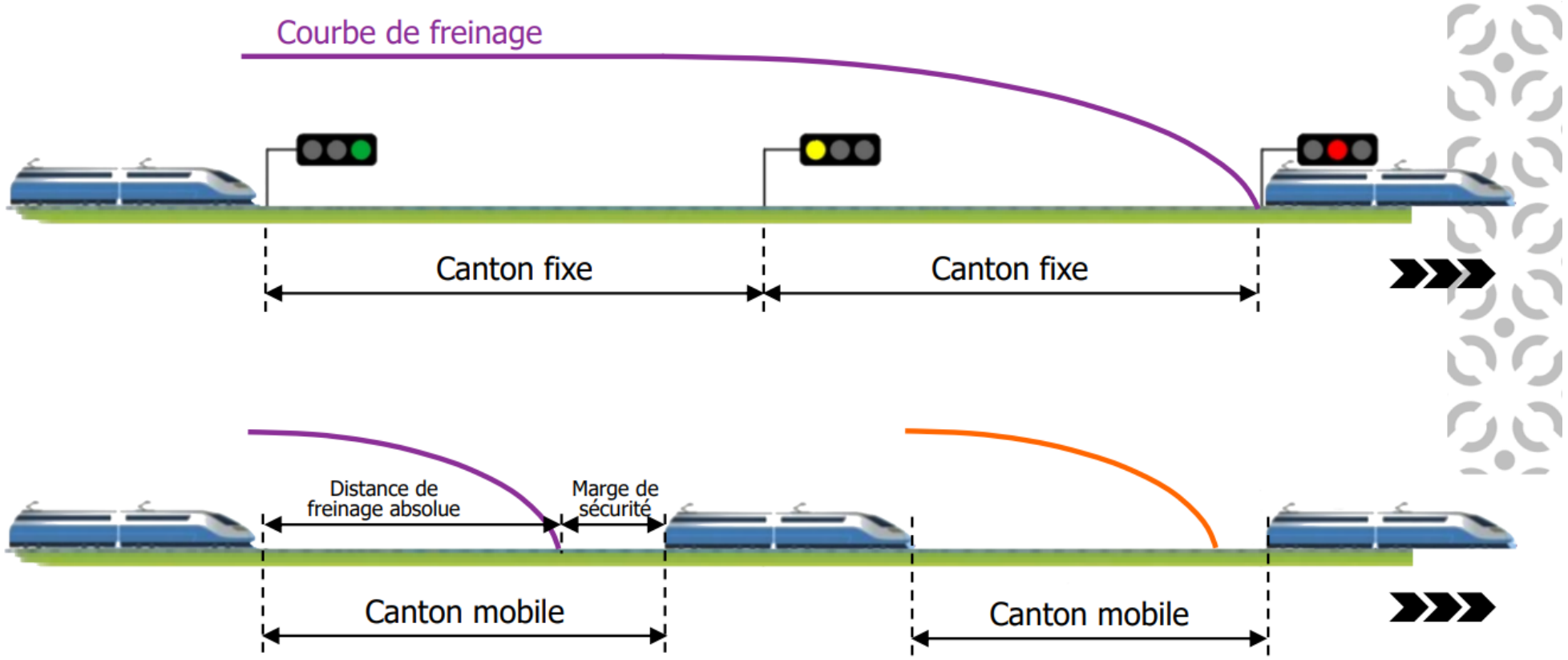
ETCS L1/L2 VS L3

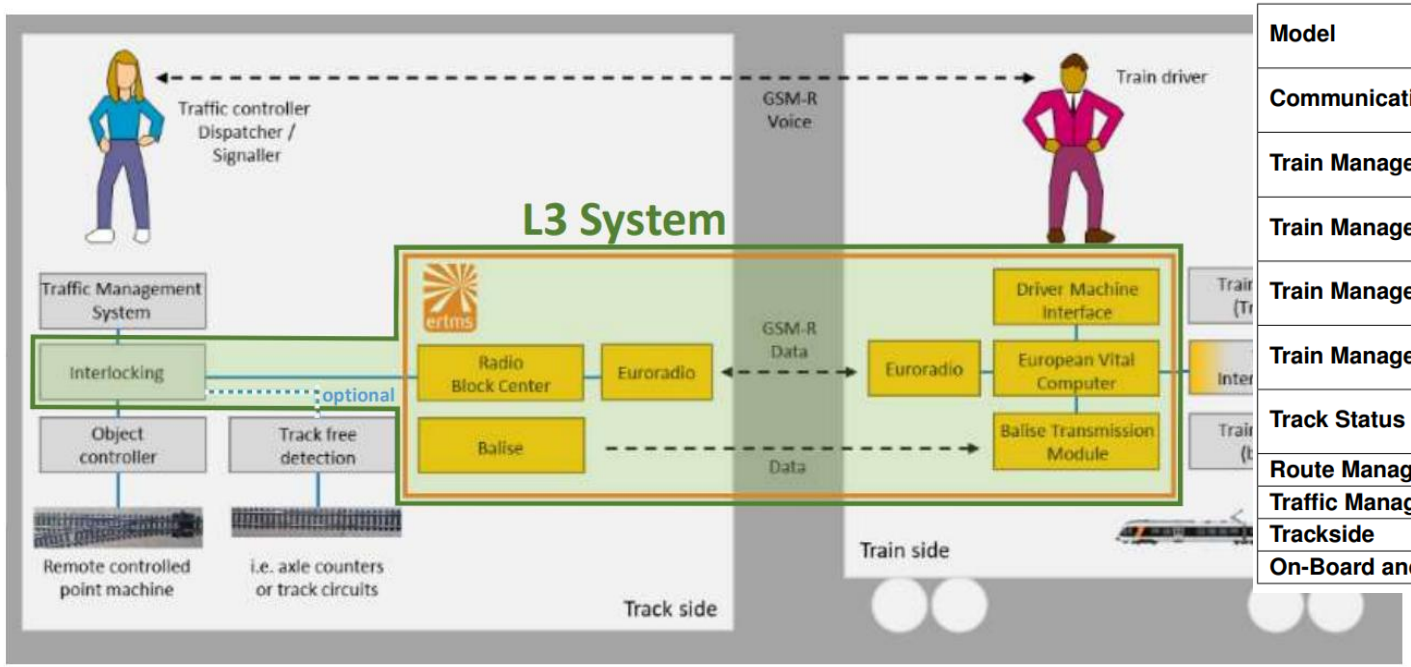


Ultimate goals:

1. **Increase network capacity on high-density lines.**
2. **Reduce installation and maintenance costs of trackside infrastructure**

Refinement of Project

- Performingrail: Performance-based Formal Modelling and Optimal Traffic Management for Moving-block Railway Signalling (2020-2023)



Simplified of the architecture of ETCS L3

Model	Form. Lang.	Tool	Type	MB Component
Communication Manager	TA	UPPAAL	Full	Trackside (Communication Management)
Train Manager (Main)	TA	UPPAAL	Full	Trackside (Communication Management)
Train Manager (ReqTPR)	TA	UPPAAL	Full	Trackside (Communication Management)
Train Manager (AckVTD)	TA	UPPAAL	Full	Trackside (Communication Management)
Train Manager (IntChk)	TA	UPPAAL	Full	Trackside (Trains Management)
Track Status Manager	TA	UPPAAL	Full	Trackside (Track Status Management)
Route Manager	TA	UPPAAL	Stub	Trackside (Route Management)
Traffic Management System	TA	UPPAAL	Stub	Trackside (Traffic Management)
Trackside	SAN	Möbius	Full	Trackside
On-Board and Comm. Net.	SAN	Möbius	Full	Train On-Board, Comm. Network

About thirty models

Thesis Proposal

- Improving for the model and searching for the right tool to handle such complexity.
- Possibility of implementing Petri nets and an algebra for DES (Max-plus, Dioids).
- Behavioural models may be based, for example, on timed automata (of probabilistic, stochastic, hybrid types) or Petri nets (timed, coloured, stochastic, interpreted), with approaches to failure analysis or reachability of feared events based on model checking (of classical, statistical, probabilistic type).

Merci de votre attention

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