



MODONBOARD

Onboard ATP

& Intelligent Driving

Gilles Poitrasson-Rivière
Alstom

WP1: Onboard ATP

- Define the design of onboard ATP subsystem
- Define standardised interfaces
 - ▶ *Onboard ATP* ⇔ *wayside ATP*
 - ▶ *Onboard ATP* ⇔ *Spot Transmission subsystem*

WP2: Intelligent Driving

- Improve the measurement of train parameter variations: acceleration/deceleration, speed & distance
- Design the correction of the command according to measurements

WP3: ERTMS Reuse

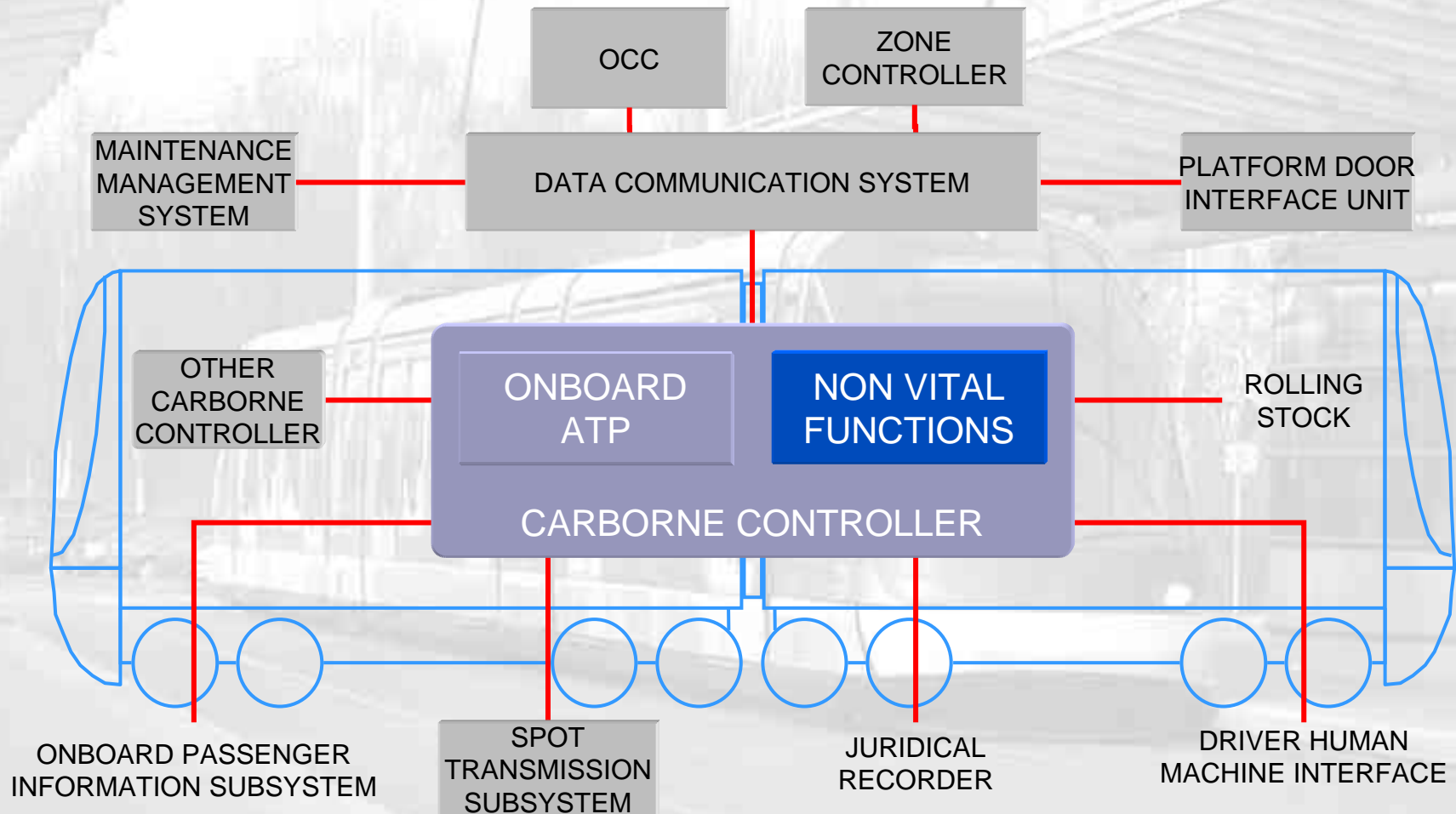
- Reuse some ERTMS modules,
- Propose some adaptations to fit with mass transit constraints

MODONBOARD: PARTNERS



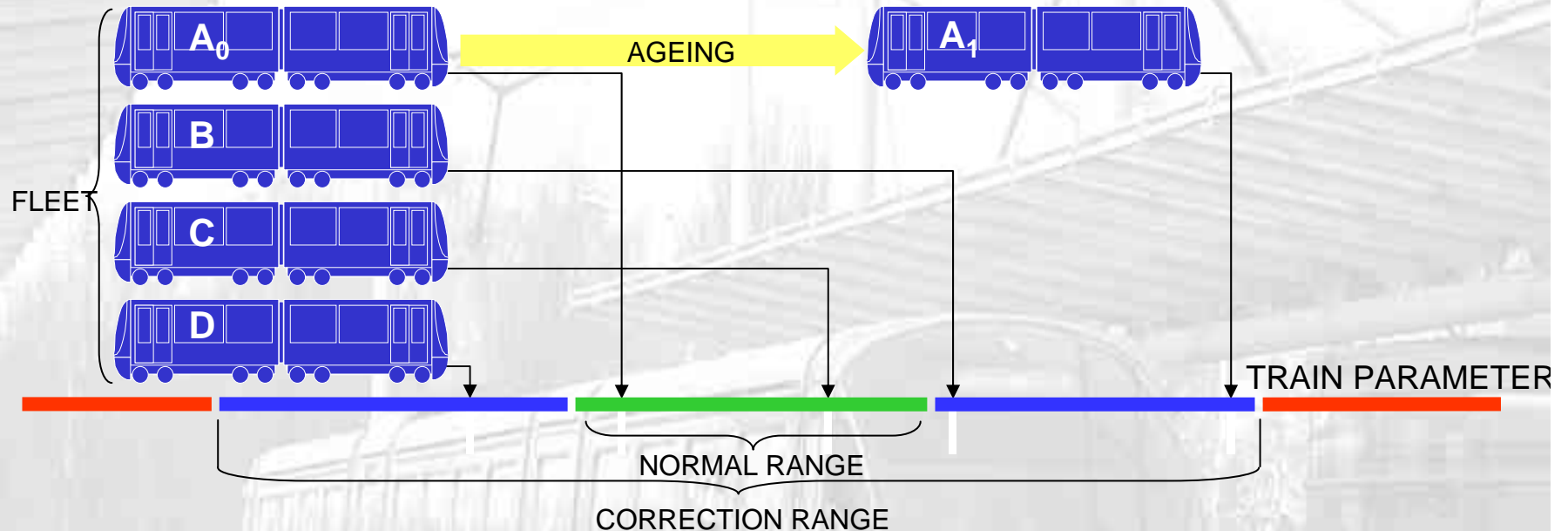
WP	WP leader	Partners involved
WP1 On-board ATP		<i>WP transferred to WP2, WP8 & WP22</i>
WP2 On board Intelligent Driving		
WP3 ERTMS Reuse	BOMBARDIER TRANSPORTATION	<i>WP transferred to WP2, WP8 & WP22</i>

MODONBOARD WP2 – INTELLIGENT DRIVING ENVIRONMENT



MODONBOARD WP2 – INTELLIGENT DRIVING

PURPOSE

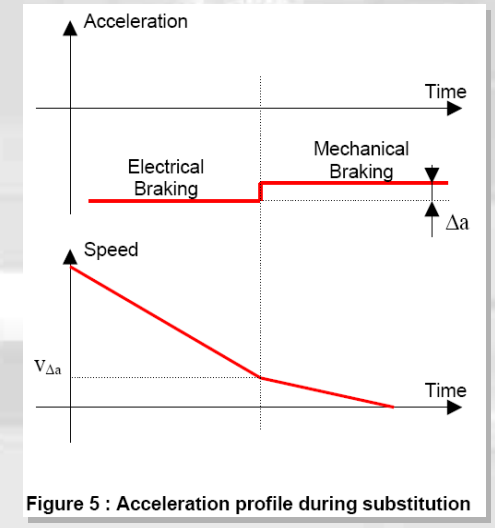
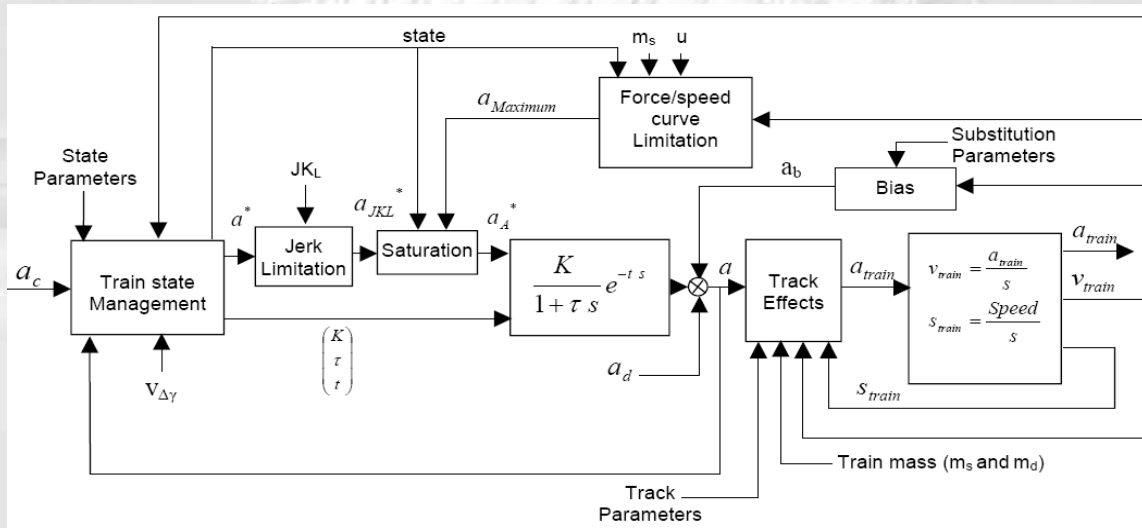
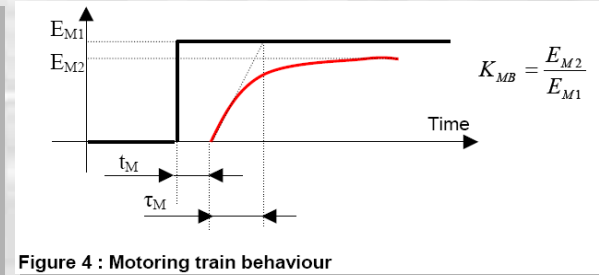
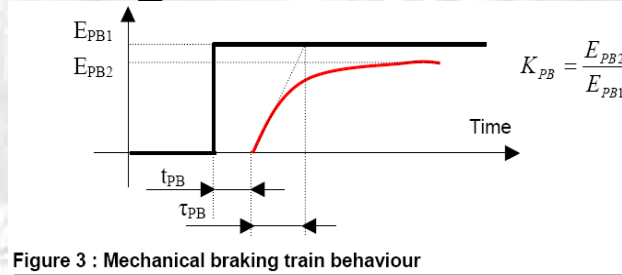
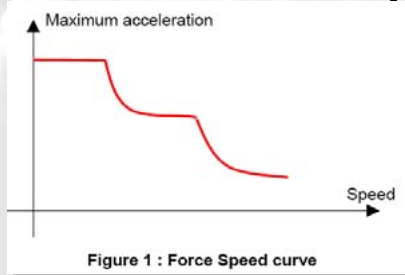


- ❑ Intelligent Driving principle addresses the problem of variation of train parameters over time and discrepancies on train parameters of a whole fleet. It automatically adapts the train control system to these variations in order to optimise each train performance.
- ❑ Train parameters to be considered : braking capability, traction capability, train reaction times, etc.

MODONBOARD WP2 – INTELLIGENT DRIVING TRAIN MODEL



- Model of the dynamic behaviour of the train taking into account parameters such as braking/traction capability, reaction times, braking behaviour (electrical and mechanical), using MathLab



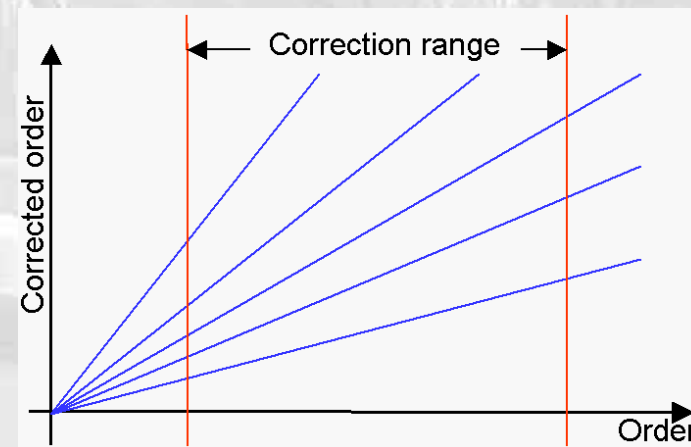
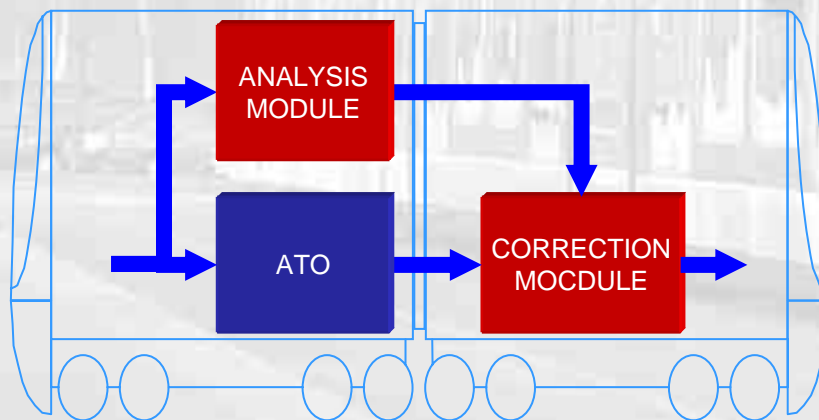
MODONBOARD WP2 – INTELLIGENT DRIVING

PRINCIPLE



For this purpose, Intelligent Driving:

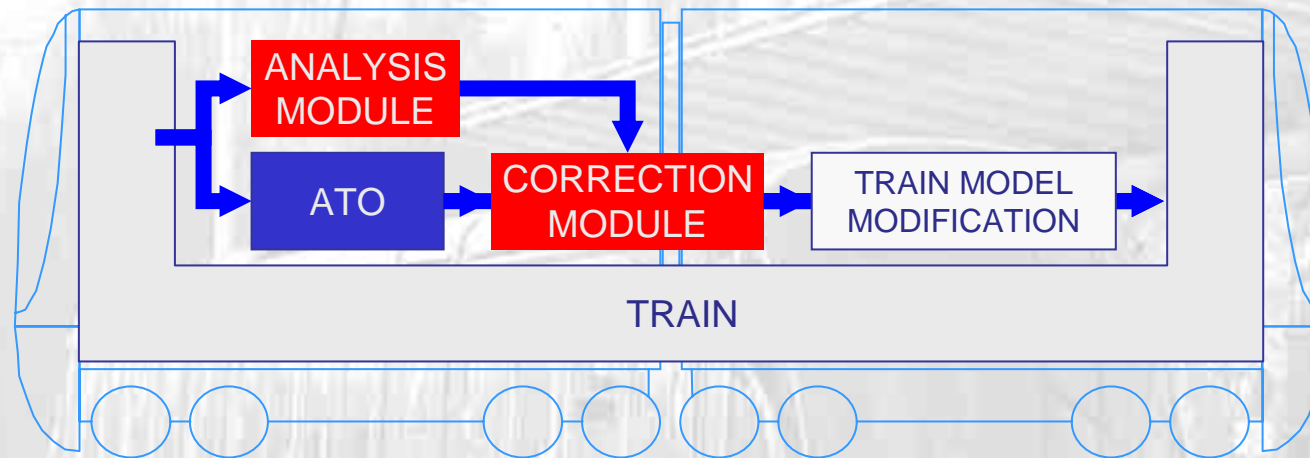
- ❑ Learns the train parameters and verifies their deviation
- ❑ Sends alarms in order to warn operation staff about the train achievable performances in the point of view of ATC
- ❑ Adjusts adaptive parameters if necessary in order to tackle with the deviation observed on the train



MODONBOARD WP2 – INTELLIGENT DRIVING DEMONSTRATION

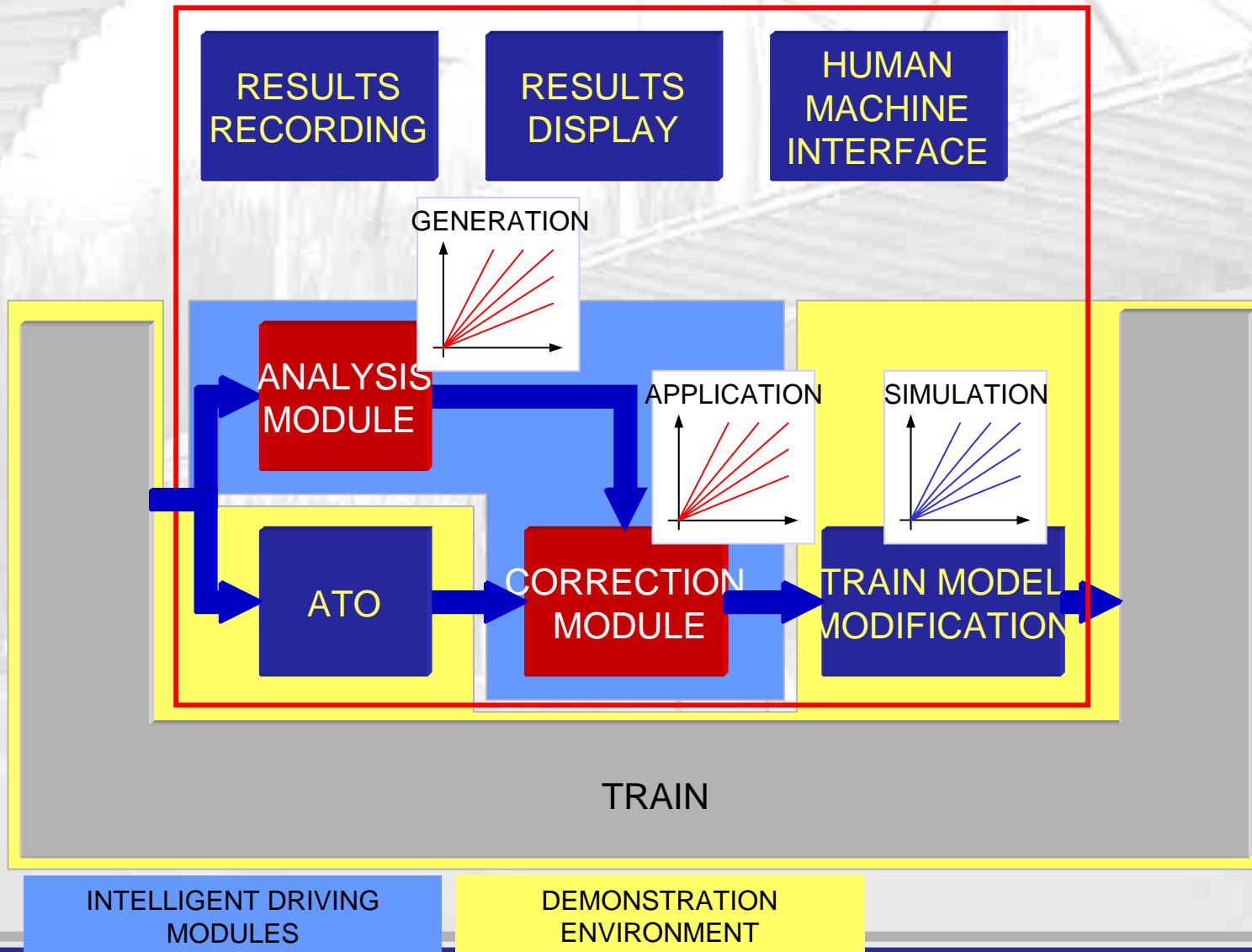


- ❑ The intelligent driving demonstration is based on automatic correction of braking commands from the ATO to the train braking system

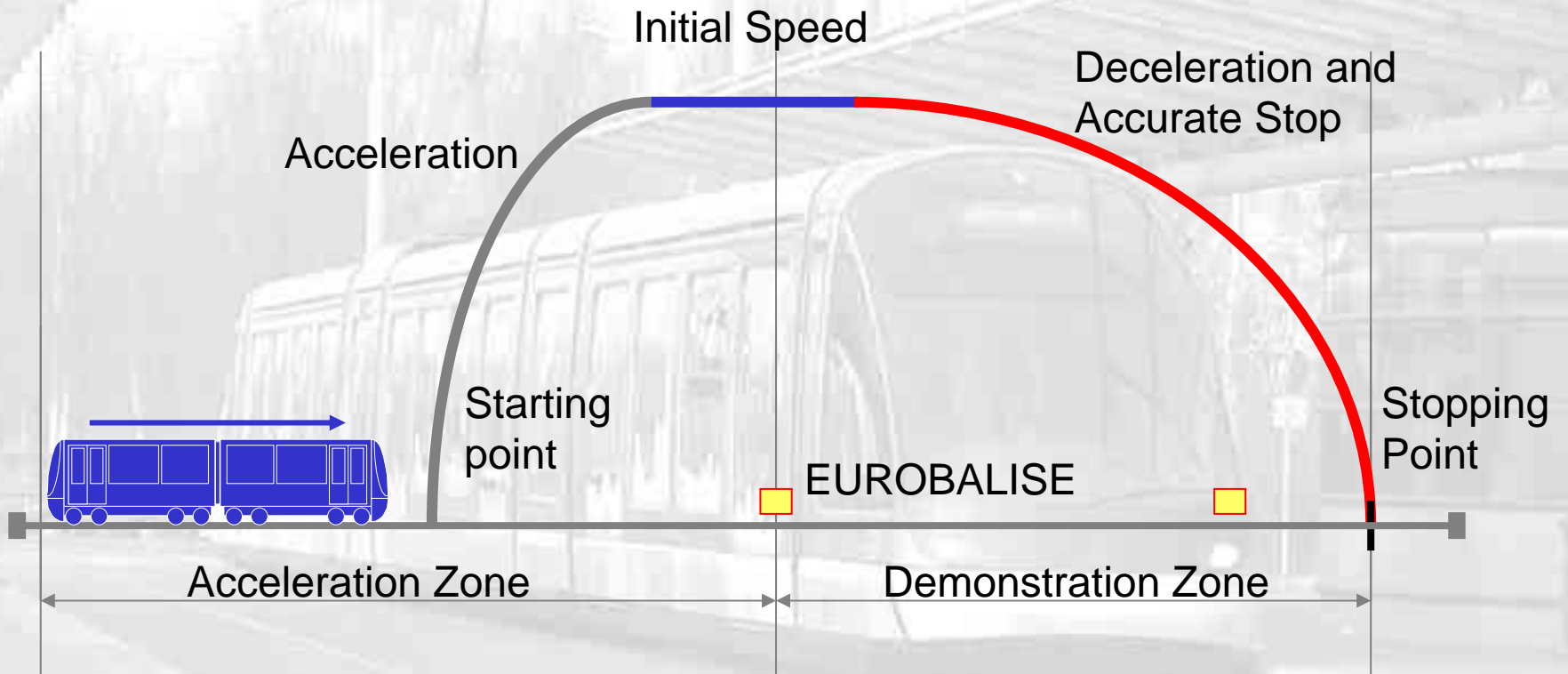


- ❑ In order to test this automatic correction, the braking capability of the train seen by the ATO is reduced.
- ❑ This reduction is implemented by the modification of the braking order (TRAIN MODEL MODIFICATION) delivered to the train.

MODONBOARD WP2 – INTELLIGENT DRIVING DEMONSTRATION ARCHITECTURE



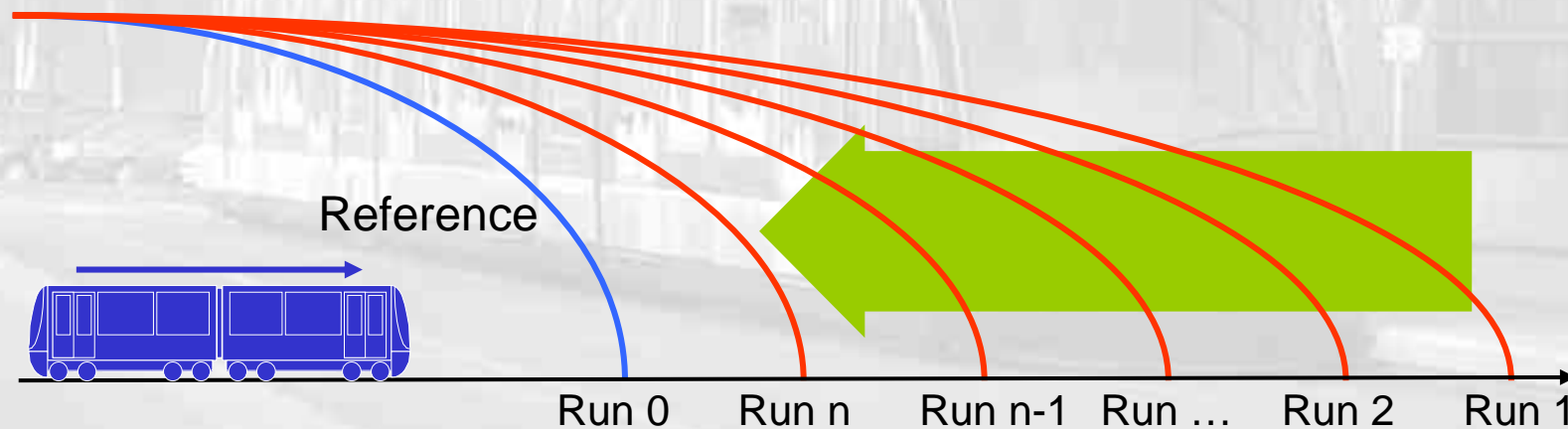
MODONBOARD WP2 – INTELLIGENT DRIVING DEMONSTRATION SCENARIO



MODONBOARD WP2 – INTELLIGENT DRIVING DEMONSTRATION SCENARIO



- ❑ The braking capacity of the train is reduced (TRAIN MODEL MODIFICATION)
- ❑ The System shall progressively adapt the ATO order to ensure the train stopping accuracy
- ❑ Depending on the reactivity parameter of the system, the accuracy shall be recovered after 10 to 15 runs.



- ❑ Objective :

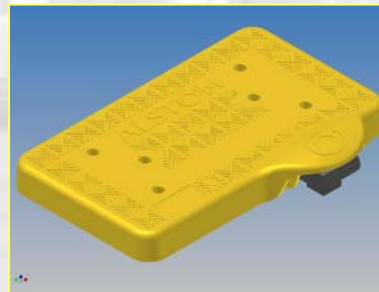
To analyse the possibility to reuse some ERTMS modules, and, if necessary, to propose some adaptations in order to fit with the mass transit constraints.

- ❑ Scope:

To analyse the reusability of the EUROBALISE spot transmission, accuracy of the re-localization (top loc) has been considered.

- ❑ Achievement :

Transit Version of the EUROBALISE Specifications





MODONBOARD

THANK YOU FOR YOUR ATTENTION !

The Alstom logo, consisting of the word "ALSTOM" in a bold, blue, sans-serif font, with a red circle containing a white dot in the center of the letter "O".

ALSTOM

A thick, solid blue vertical bar is positioned on the left side of the slide, extending from the top to the bottom.