

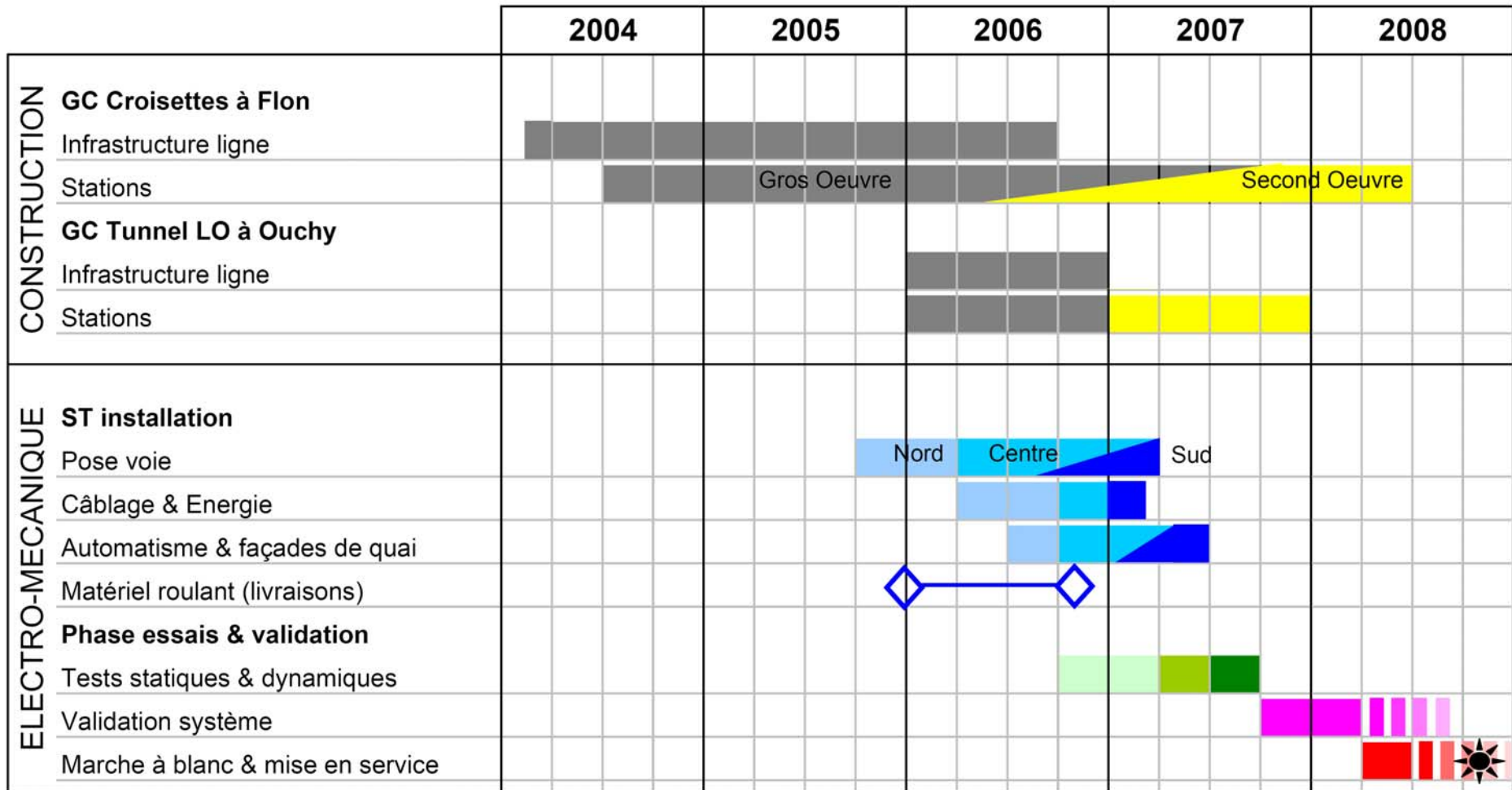
“Lausanne m2” Project Overview



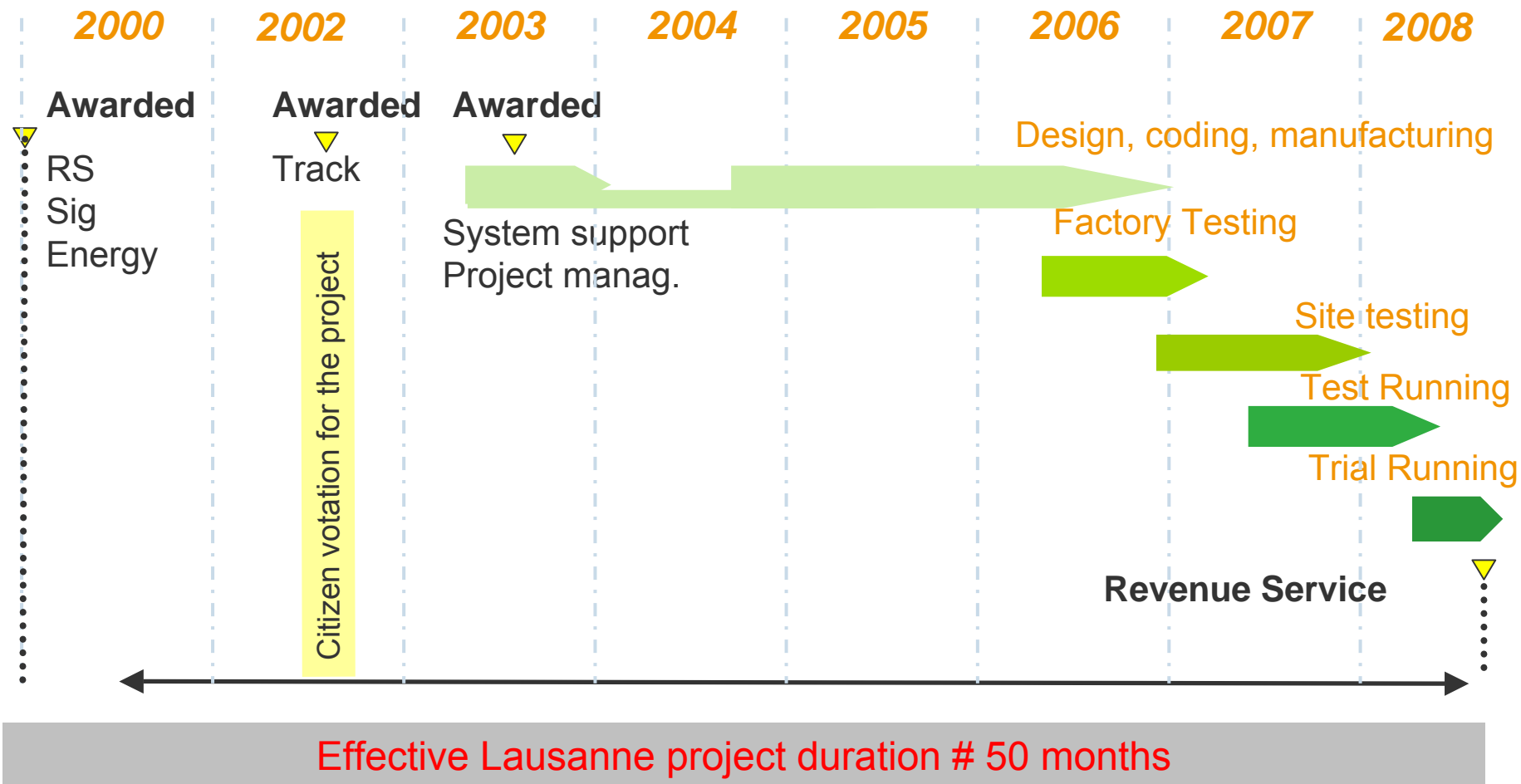
TRANSPORT |

ALSTOM

Project Overview

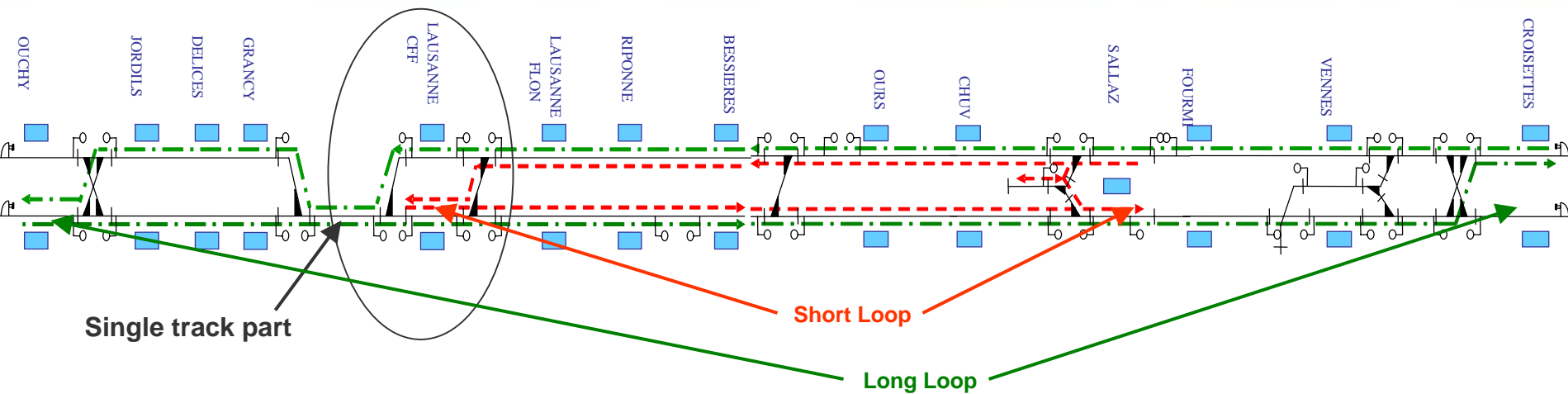


Lausanne Project Programme



- Commercial service start forecast between June 2008 and December 2008 -

Project Overview (1/26)



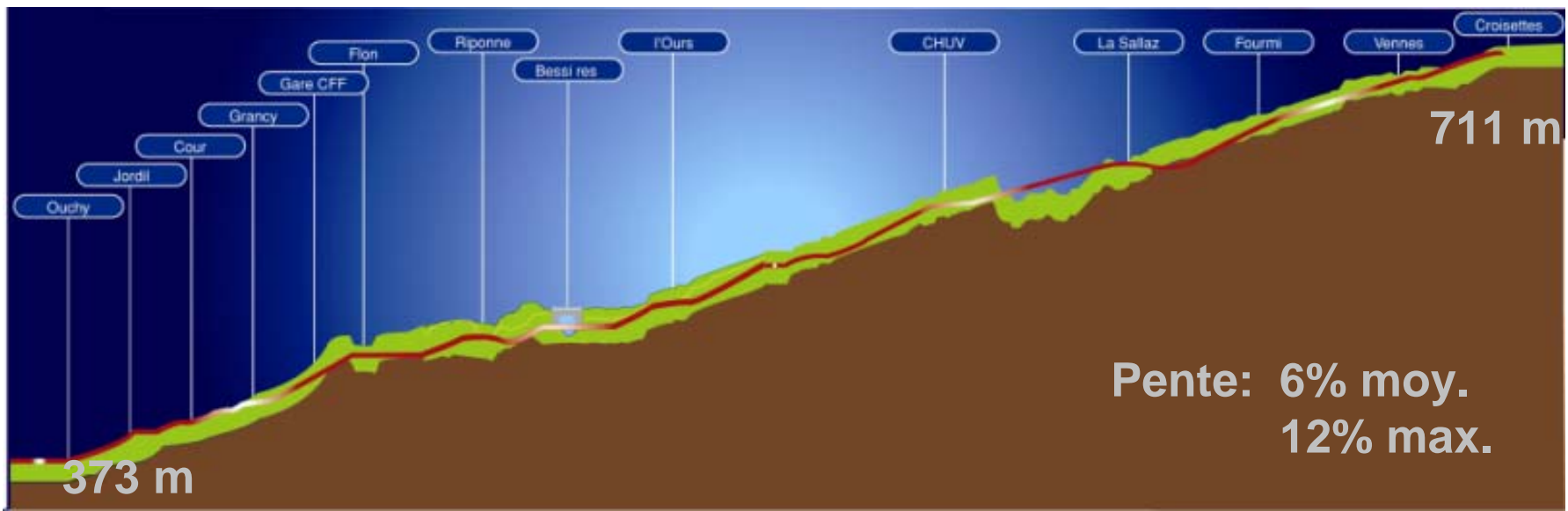
Transports publics de la région lausannoise

373 m

Project Overview (2/26)

Lausanne particularity

uphill winding profile ...



Project overview (3/26)

Manless Metro Lausanne Ouchy

The contracts for Alstom: 6 separate contracts

- System Engineering Support: System functions, architecture, interfaces,
- Signalling (Rolling Stock Pilot)
- Rolling Stock,
- Track,
- Power supply,
- Maintenance

Customer MLO responsible for system integration

Amount of the contracts : ~170 M€

Product line & Site:

TGS (Infrastructure) Lausanne, Saint-Ouen.

Rolling Stock , Lausanne, Valenciennes, Charleroi, le Creusot, Ornans, Montréal, Villeurbanne.

TIS (Signalling) Lausanne, Saint-Ouen, Montréal, Meudon, Villeurbanne, Bologne .

TLS (Train Life Services) Saint Ouen, Neuhaussen

TRANSPORT



Characteristics of the project:

- 6 km (track 13,5km), among which 5 km in tunnel & 1km in open area with track heating system
- 14 stations (mean inter-station: 460m), with Platform Screen Doors
- Average slope: 5.7% (12% max),
- Commercial speed ~16 km/h, max speed 60km/h,
- Capacity 6600 pphd at 4 p/m²,
- 2 overlapping loops ; possible bi-directional operation
- Single track portion
- Stopping accuracy: +/- 30 cm,

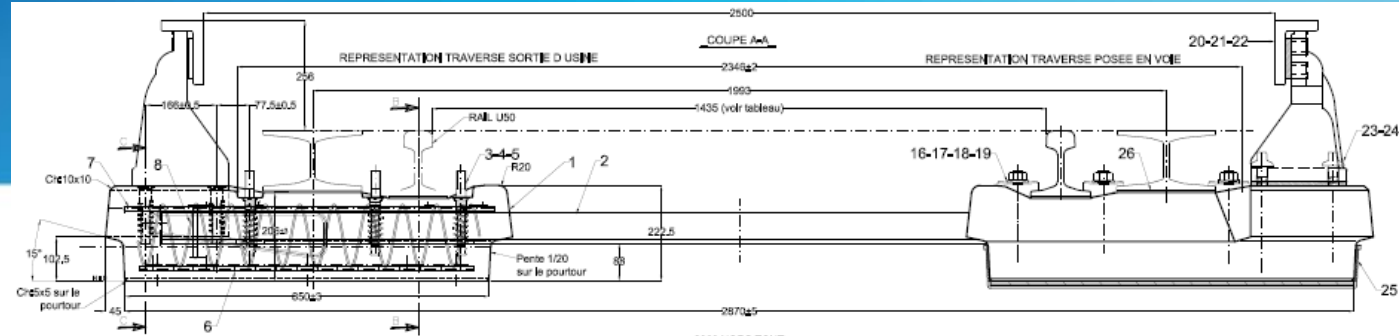
- Guiding rail power collection, 750Vdc
- 2 car trains : 15 units, 30.7m long
- rubber tyres consists with magnetic shoe brakes (EB), all bogies are motorized, MP89 carry over.
- On board CCTV-PA-PIS

Project overview (5/26)

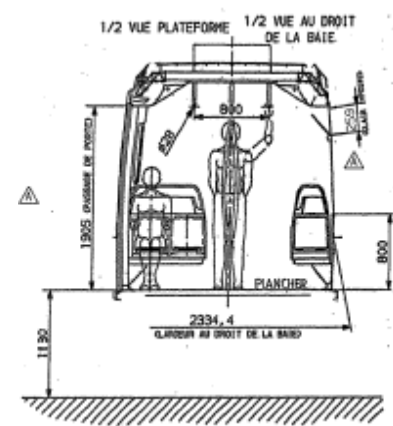
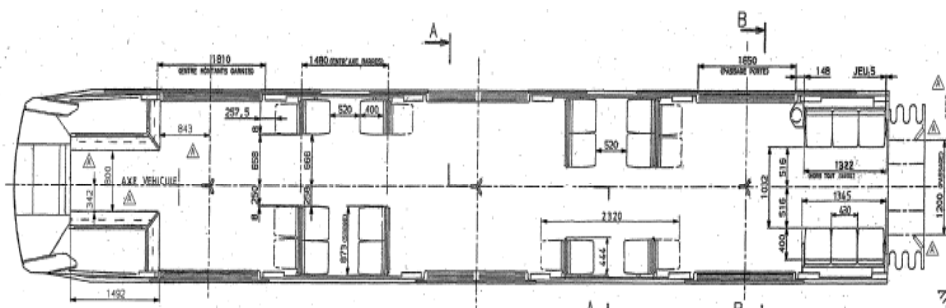
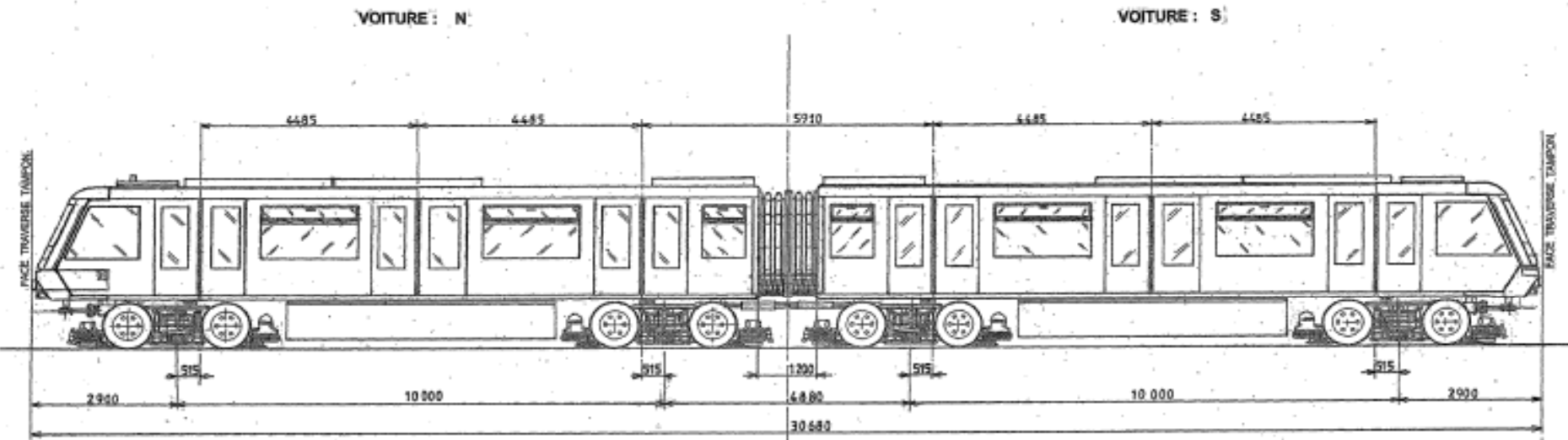
Characteristics of the project:

- 2 overlapping loops ; possible bi-directional operation
- Single track portion
- Headway: 2mn in middle section, 4mn between end terminals,
- Stopping accuracy: +/- 30 cm,
- Driverless operation in Main Line and Depot
- 3 driving modes:
 - Full Automatic mode CBTC Moving block operation,
 - Coded Manual mode,
 - Restricted Manual mode)
- RAMS:
 - QSI = Quality of Service Indicator= 0.9987 (train delay, km not ridden)
 - safety level 10^{-9} per train per hour
 - system availability: 99.99%
- Ability to interface specific devices
 - Train Washing machine
 - Tires pressure detector

Project overview (track)(6/26)

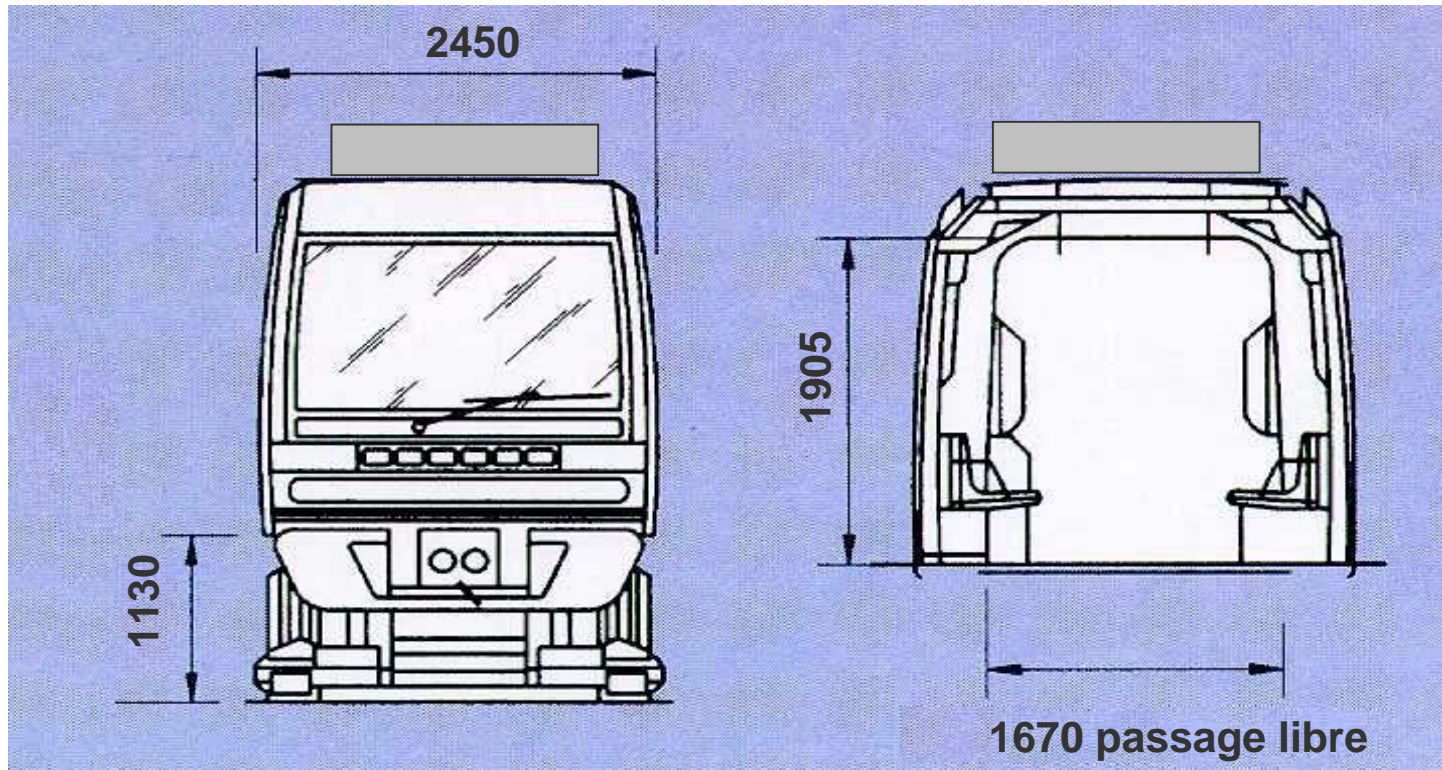


Project Overview (Rolling stock) (7/26)



Overall dimensions

Project Overview (Rolling stock) (8/26)



Overall dimensions

Project Overview (Rolling stock) (9/26)

Capacity :

Seated passagers :		62 passagers	
Normal load :	4p/m ²	226 passagers	
Full load :		6p/m ²	324 passagers
Maximum load:	8p/m ² (*)	364 passagers	

Car weight :

Tare :	-	27,5 tons	
Normal load :	4p/m ²	34 tons	
Full load :		6p/m ²	37 tons
Maximum load :	8p/m ² (*)	40 tons	

(*) : considering that standing passengers cover 85% of the floor surface

Project Overview (Rolling stock) (10/26)

Metro trains made of two cars identical back-to-back vehicles, inspired from Paris MP89 et Santiago NS93

Four single-motor bogies, 100% motorised

Performances

- Maximum speed:
 - 60 km/h on straight, horizontal track
 - 47 km/h in 12% up-hill slope
- Maximum acceleration : 1.3 m/s^2 (straight, horizontal track)
- Maximum deceleration : 2.2 m/s^2 (blended braking)
- Traction
 - 4 inverters (IGBT)
 - 4 asynchronous motors of 314 kW (@ 2500 tr/mn)
 - positive pad + 750Vdc in contact with guiding rail

Braking modes are achieved by different actuators :

- parking brake : magnetic track brakes (permanent magnets)
- service brake : mechanical brakes (brake pads on auxiliary wheel) and electrical braking (rheostats and regeneration on line),
- emergency brake : mechanical brakes and magnetic brake pads

Brake pads are applied on the auxiliary steel wheels.

Rheostats are located on the roof on the vehicles, with natural cooling.

Major equipment cases are doubled on the two vehicles in order to obtain maximal availability and safety.

For example, each train is equipped with the following :

- two static converters,
- two batteries,
- two full traction chains,
- two air compressors.

Furthermore, the parts incorporate, from their design phase, the specific constraints of the Lausanne weather conditions.

- for example, the two air compressors have an increased air drying capacity to ensure absence of humidity in the pneumatic circuits and equipment.

Project Overview (Rolling stock) (13/26)

Incorporation of the magnetic track brake actuators in the bogie.

Negative and ground pads .

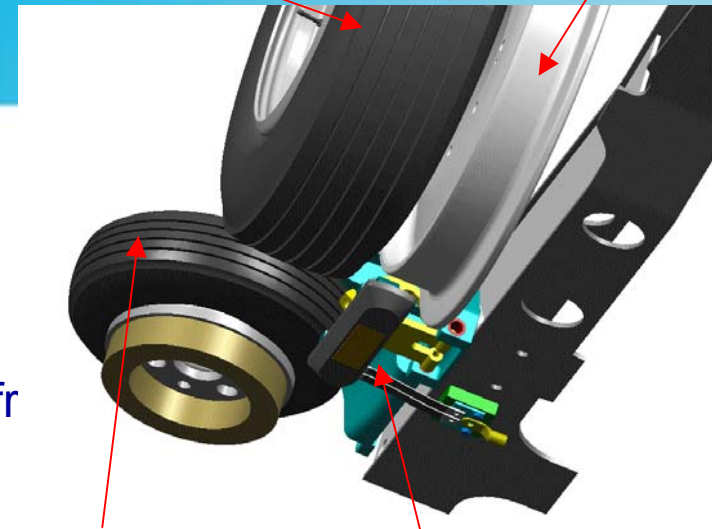
Pneumatic panels and air reservoirs mounted on bogie frame

Track cleaning brushes, driven by the guiding wheels.

Obstacle detection bar on front bogies.

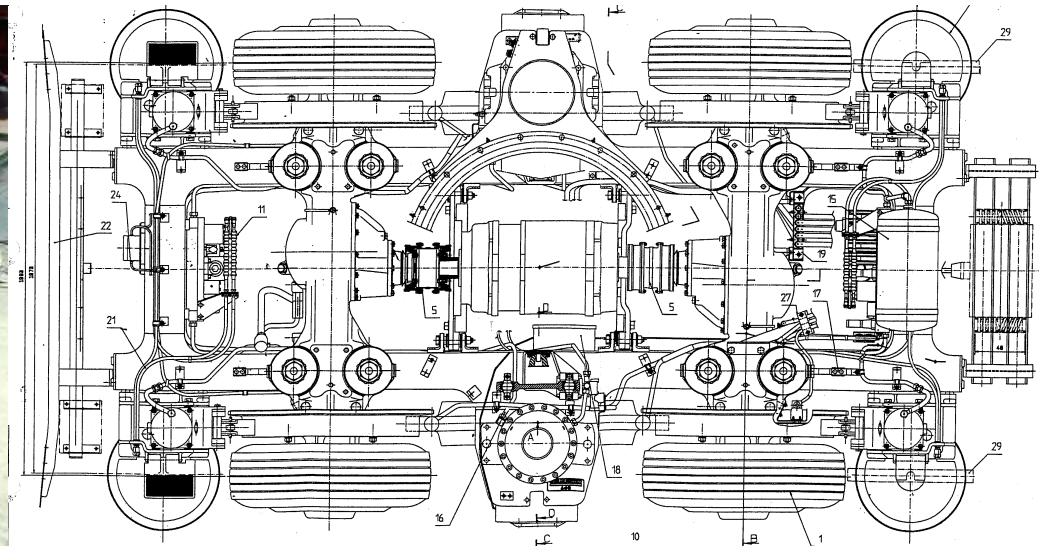
Running tyre

Auxiliary wheel



Guiding wheel

Ground pad



Bogie : main features

Interior fitting : main features

Cooled ventilation (13 kW @ 32 °C)
and heating (13 kVA)

1 camera mounted at each end of the passenger area. Continuous filming and image recording can be triggered by control centre (PCC) or by specific events.

A microphone fitted next to the camera allow "discrete listening" by controllers at the control centre. PCC can also send audio/visual messages to all or selected trains.

2 passenger information displays.

Emergency call devices to communicate with control centre.

Locations dedicated for wheelchairs.

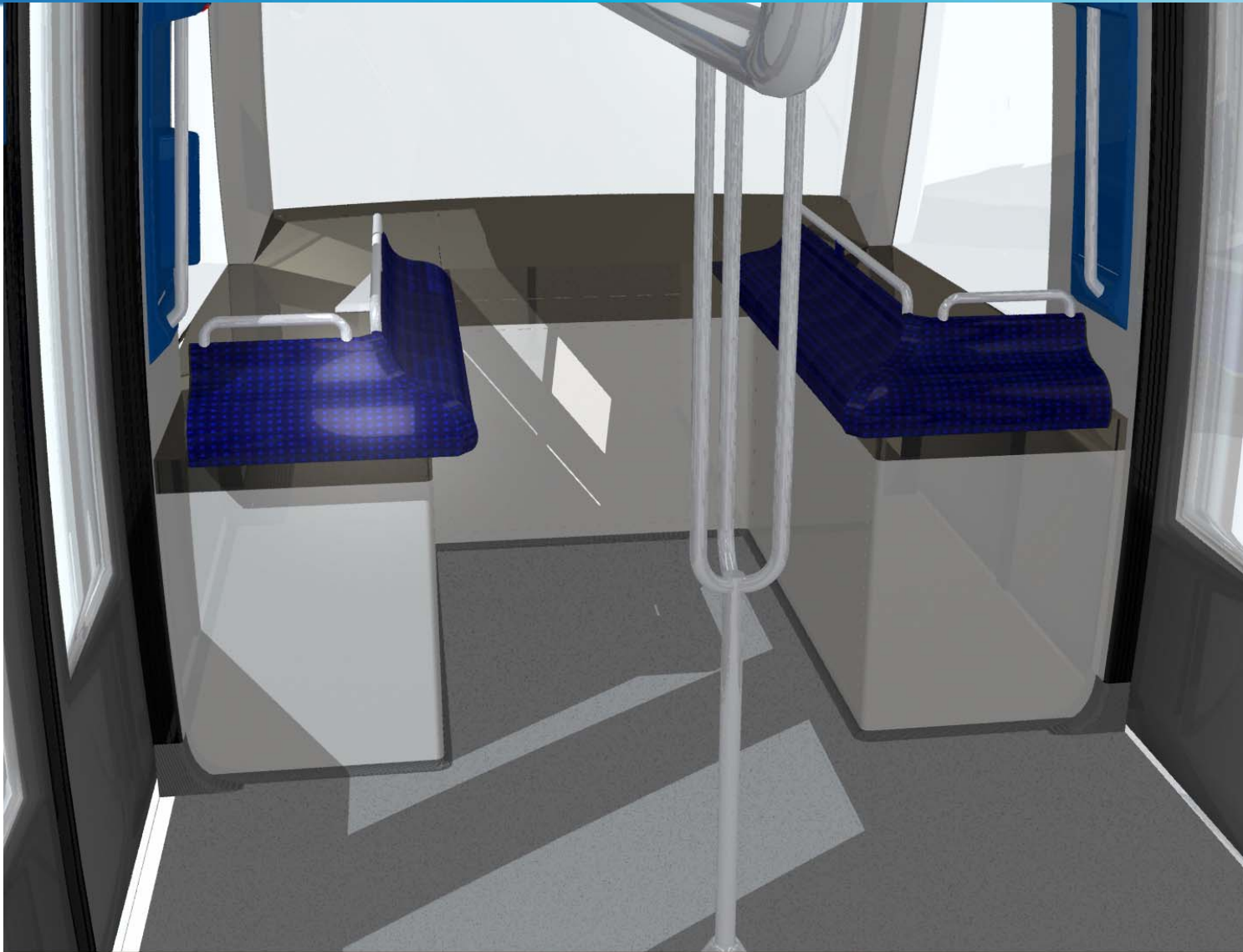
New driving desk with digital display panels allowing easier maintenance.



Project Overview (Rolling stock) (15/26)



Project Overview (Rolling stock) (16/26)



Project Overview (Rolling stock) (17/26)



Project Overview (Signalling) (18/26)

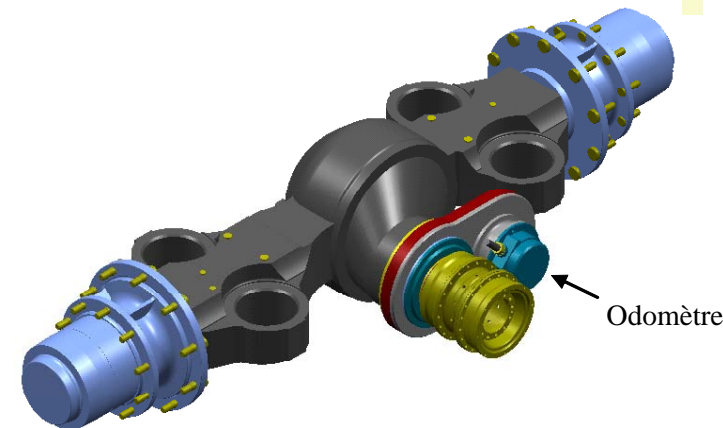
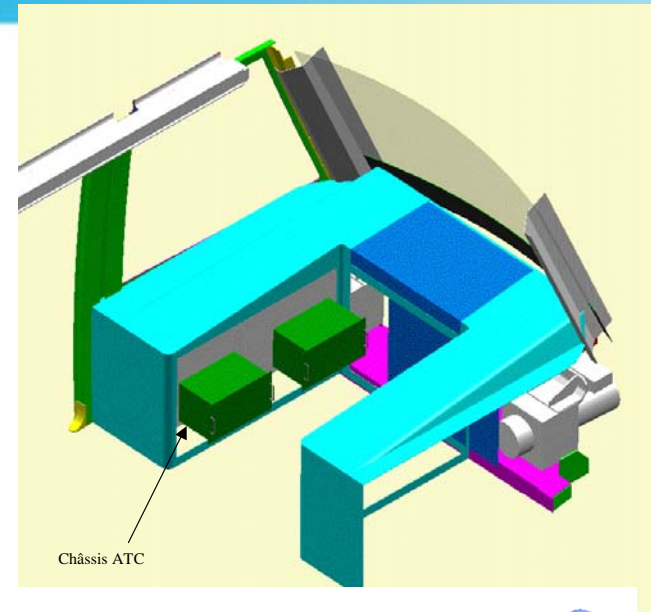
URBALIS™ CBTC Lausanne MASTRIA™ Trainborne equipment

Driverless ATP + ATO

Centralized and redundant architecture for the ATC On Board

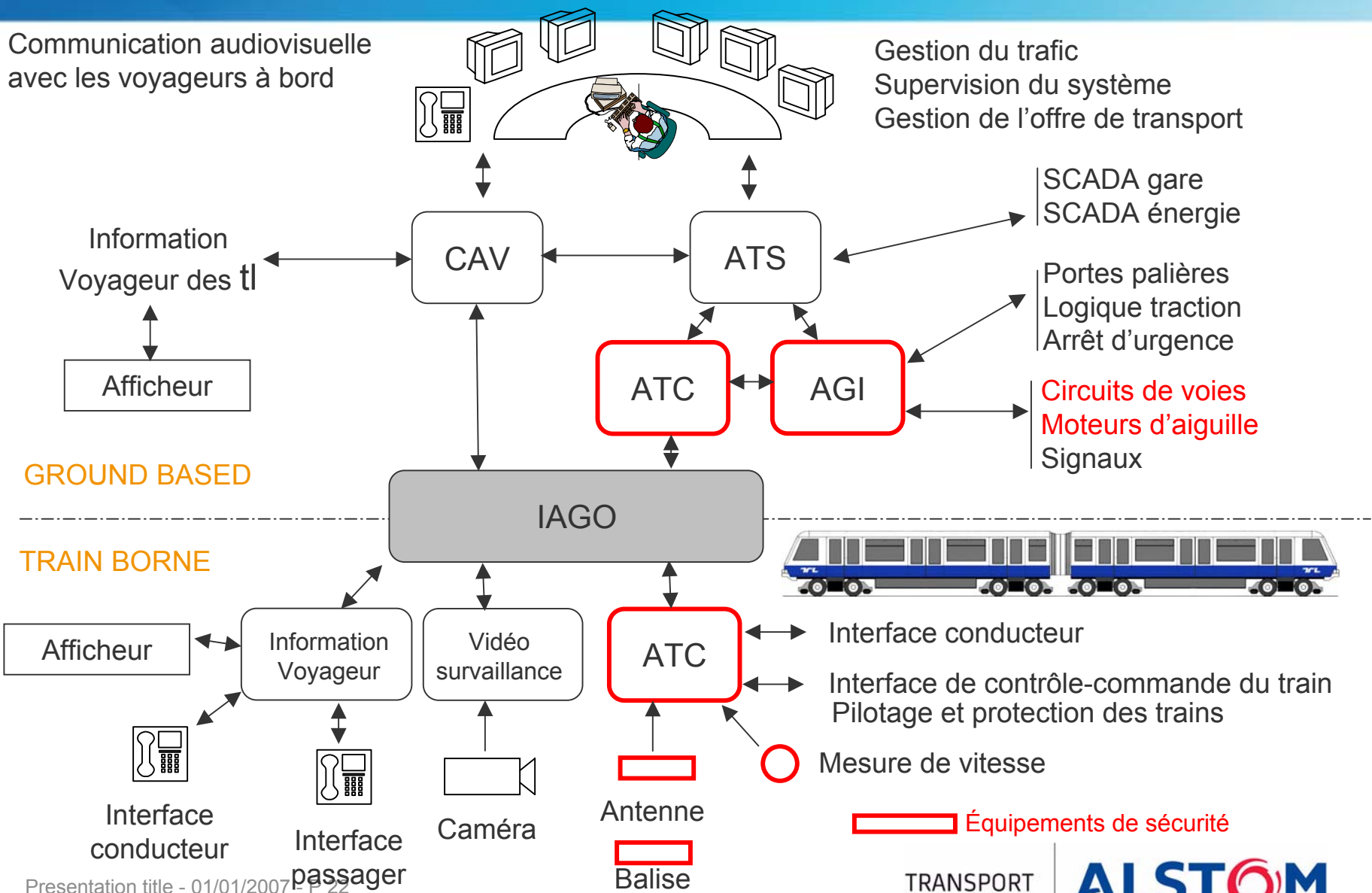
Unmanned train status management (remote controlled Wake-Up/Sleeping in stabling, Depot or Mainline service management)

Gateway from Rolling Stock to OCC



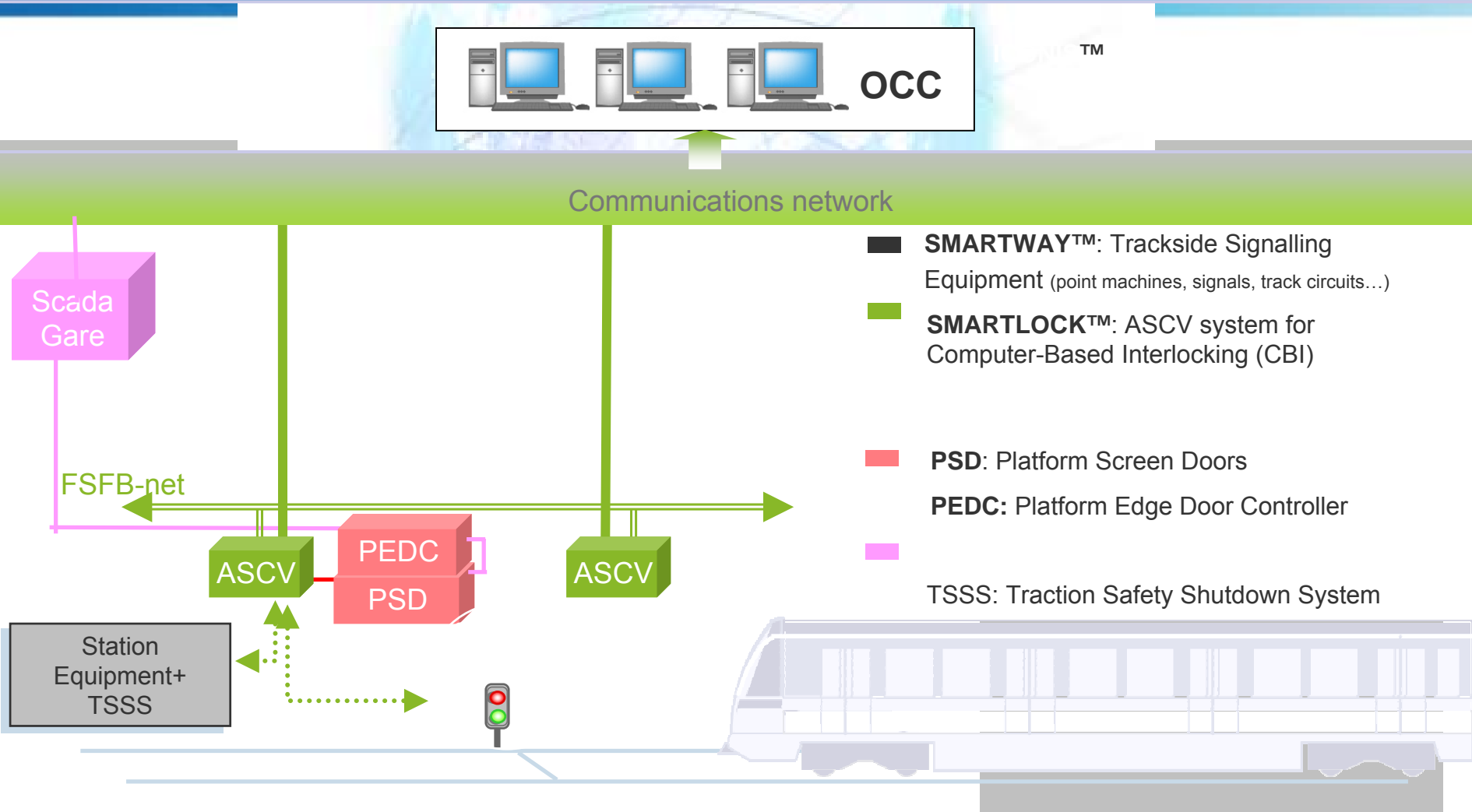
- High performance system: more flexibility for the operator -

Project Overview (Signalling) (23/26)



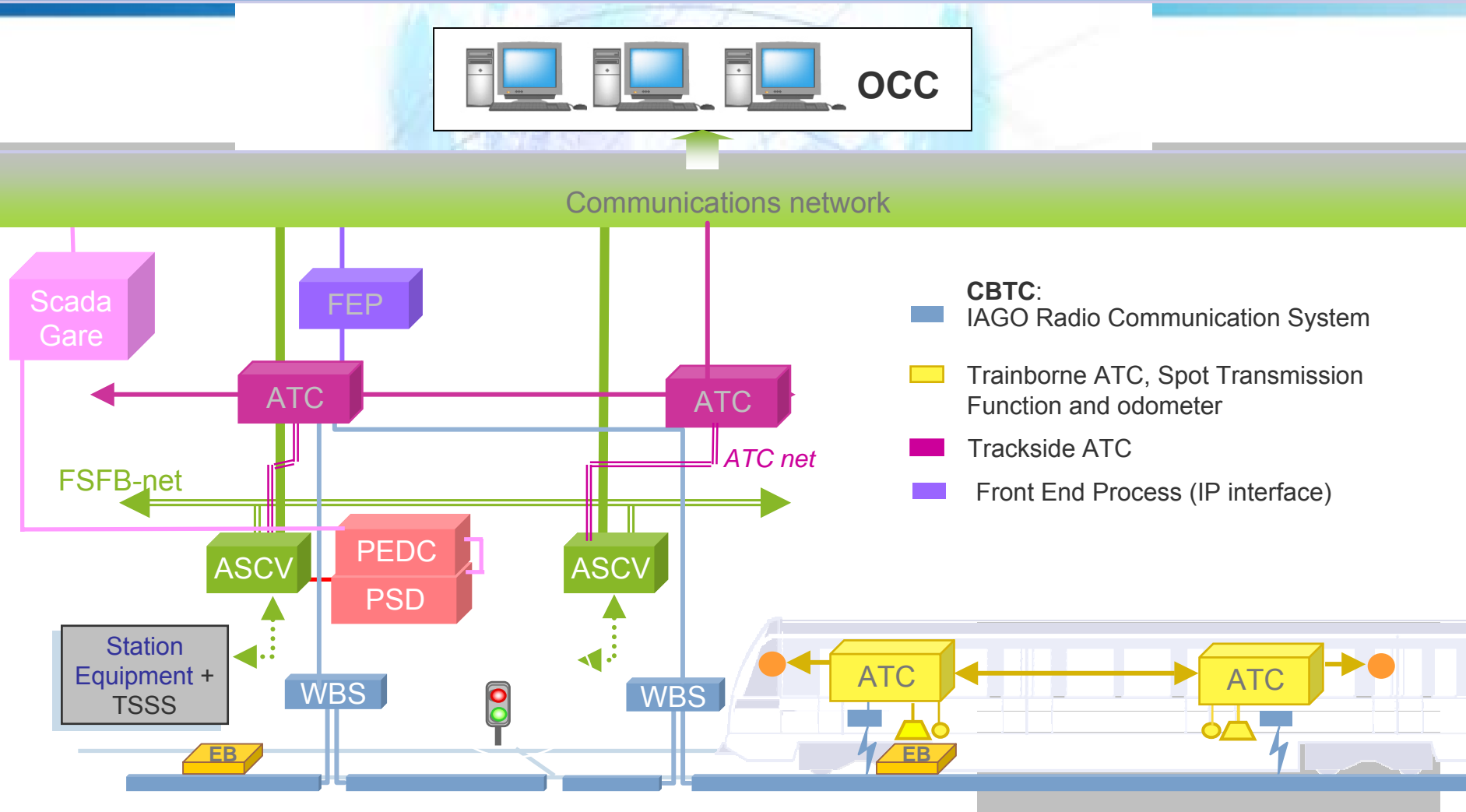
Project Overview (Signalling) (19/26)

URBALIS™ 300 CBTC Lausanne
System & PSD/Scada Gare
architecture



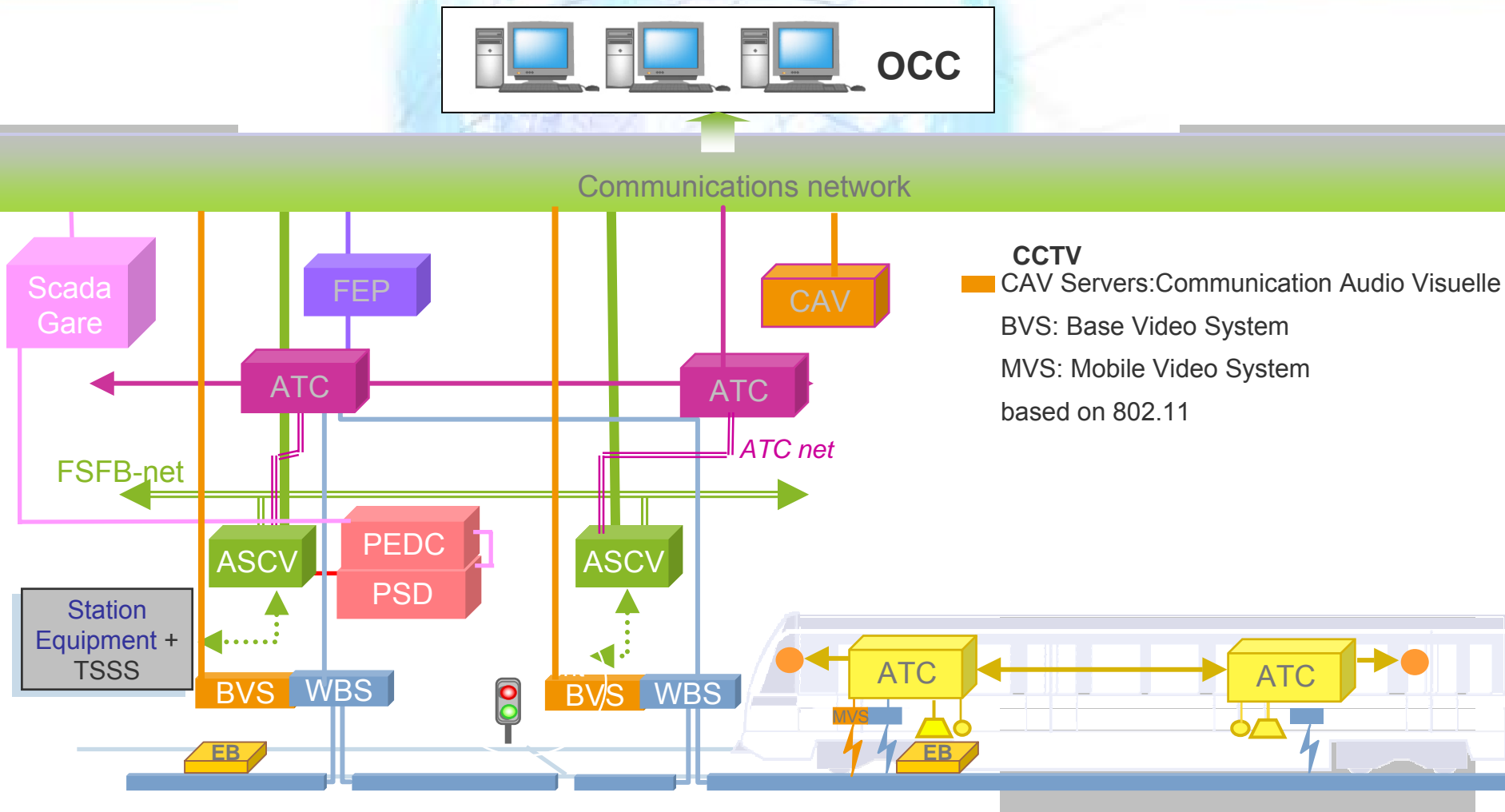
- A modular architecture which evolves with operator needs -

Project Overview (Signalling) (20/26)



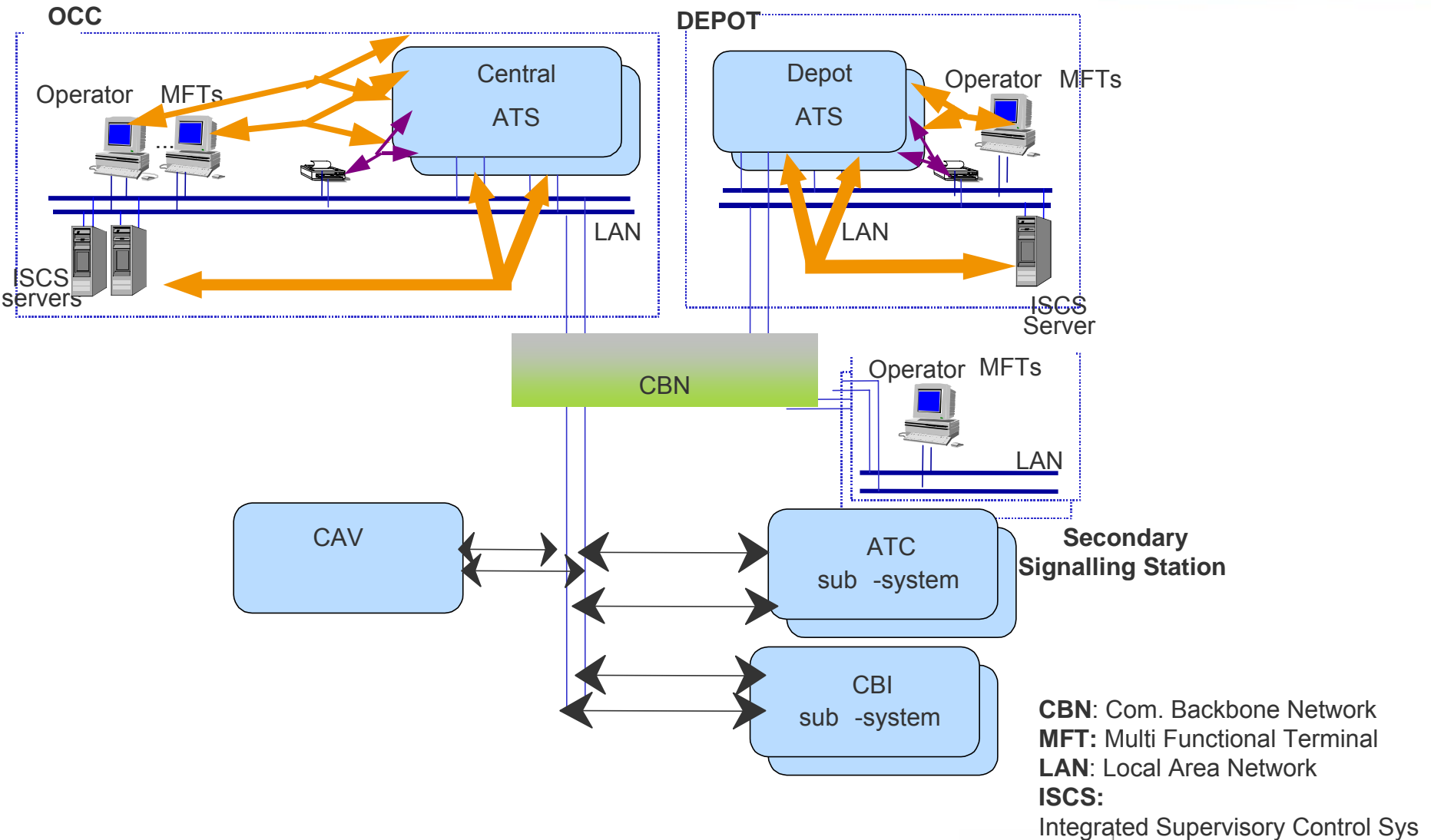
- Signaling System and Platform Screen Door Architecture -

Project Overview (Signalling) (21/26)



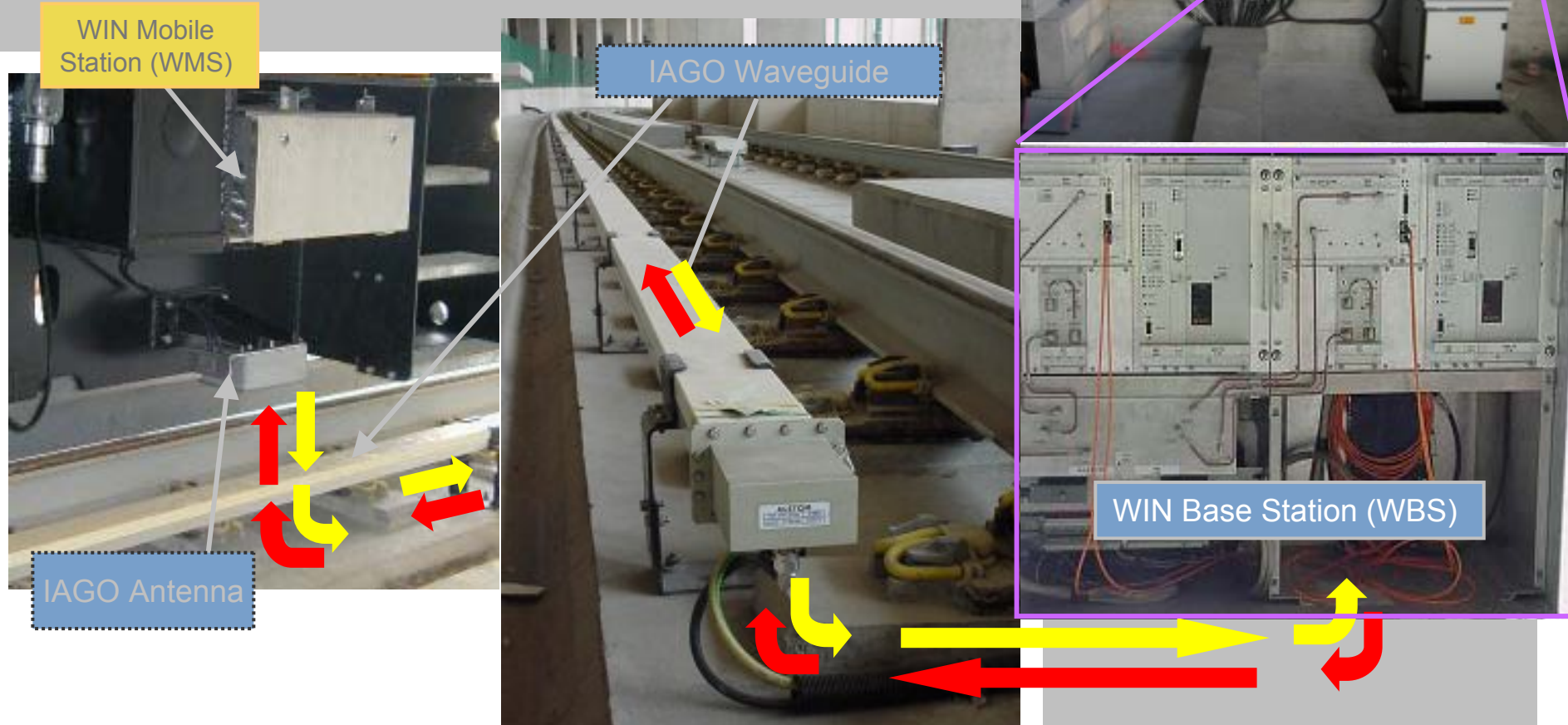
- Signaling System and Platform Screen Door Architecture -

Project Overview (Signalling) (22/26)



Project Overview (Signalling) (24/26)

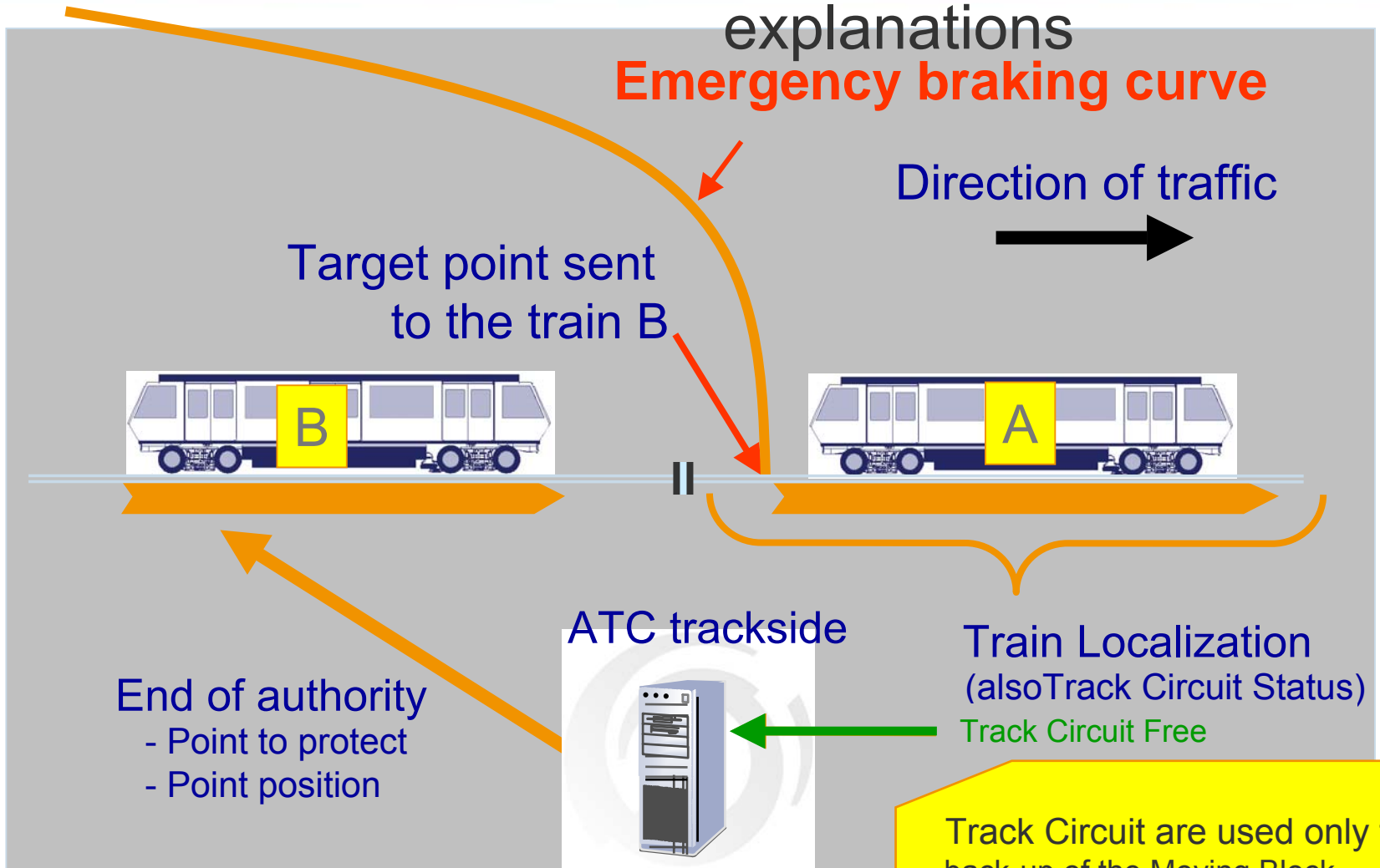
URBALIS™ CBTC Lausanne Radio Communication



Radio transmission through Waveguide with signalling and video information
- Proven Radio Communication System based on IAGO media -

Project Overview (Signalling) (25/26) 200 Mastria™ Functions

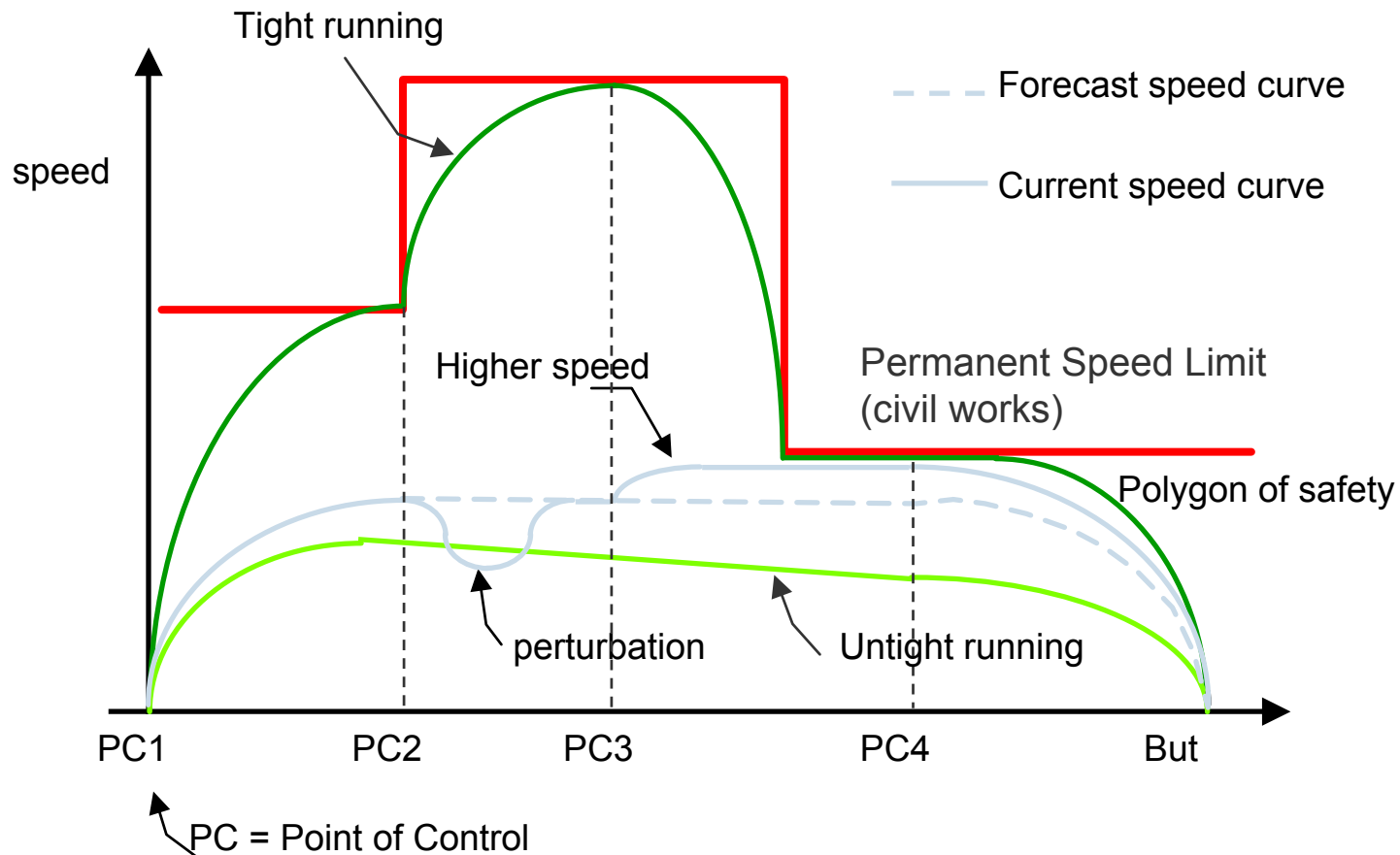
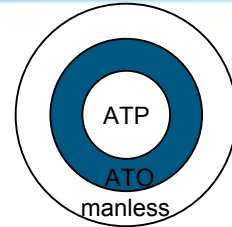
Distance To Go explanations



Urbalis

Project Overview (Signalling) (26/26)

Principle of ATO regulation



- **ATO: Automatic Train Operation** -

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