

# TRENITALIA: ERTMS BL3 Migration Plan – A technological opportunity

Alessandro Valentini

Technical Department – Engineering

#CCRCC2019 – The ERTMS conference



# Trenitalia Fleet



## ERTMS High speed Fleet, Class A.....TO BE UPGRADED:

Rolling Stock Class	Fleet Consistency	SW Baseline	STM	SSB Supplier
ETR 1000	50	2.3.0.d	SCMT	HITACHI STS
ETR500	30	2.3.0.d	SCMT	HITACHI STS
ETR 500	30	2.2.2 +		ALSTOM
ETR 600	12	2.2.2 +	SCMT	ALSTOM
ETR 610	7	2.2.2 +	SCMT	ALSTOM
ETR 485	15	2.2.2 +	SCMT	ALSTOM
ETR700	17	2.3.0.d	SCMT	HITACHI STS



## Regional & Long Haul, Class B Fleet ..... TO BE RETROFITTED:

- ❑ SCMT (Set-up: 2003 –2010) Equipped Vehicles more than n.**3200**
- ❑ SSC – BL3 (Set-up: 2009 – 2011) Equipped Vehicles more than n.**1130**

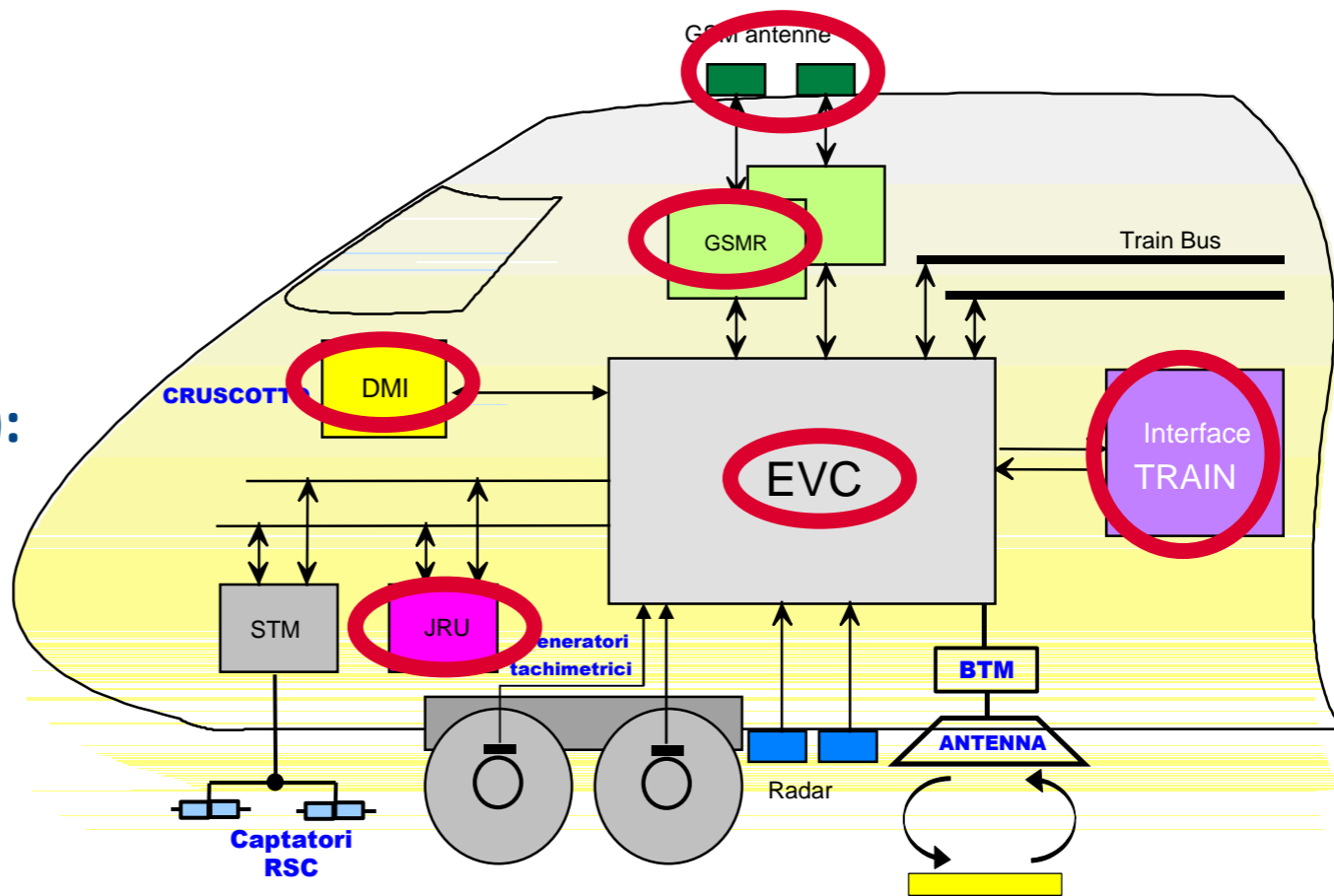
# Technical Impact of Introduction of ERTMS B.L. 3.6 on Trenitalia Fleet:

## High Speed Fleet (Upgrade) :

- DMI SIL 2 Integrated ETCS+STM SCMT/SSC
- Professional modem GPRS, STI 2016
- Upgrade SW Baseline 3.6

## Regional & Long Haul Fleet (Retrofit):

- DMI SIL 2 Integrated ETCS+STM SCMT/SSC
- **New Mother board**
- Professional modem GPRS, STI 2016
- Installation SW Baseline 3.6
- **JRU**
- **Train interface (I/O ERTMS)**



## Key factors for Introduction of ERTMS B.L. SW 3.6

- ❑ Reduced installation time in order to be alligned to trackside deployment scheduling
- ❑ Cost savings, for the maintenance of the system (reduction of Life Cycle Cost)
- ❑ Increasing of reliability/availability of the new applications



# ERTMS return of experience: main critical points (1)

## Radio Disconnections, *Statistics of high speed fleet radio communication:*

TODAY: 12000 ERTMS calls/month on nearly 150 highspeed vehicles → about 7 emergency brakings per month due to loss of radio link.

NEXT FUTURE: After upgrade/retrofit Trenitalia Fleet about 5000 vehicles → a forecast of 230 radio disconnections per month!

## Main issues:

- Single Mobile Terminal connectivity problems (HO to RBC)
- RF chain problems (antennas, connectors, cables, etc..)
- Problem due to interaction onboard-trackside (Implementation of Euroradio protocol)



- ❖ A huge work on RF radio chain is required:
  - ✓ Professional modem devices
  - ✓ Optimized: RF cable, GSM-GPRS antennas.
  - ✓ Debug through radio tracing datalogger.



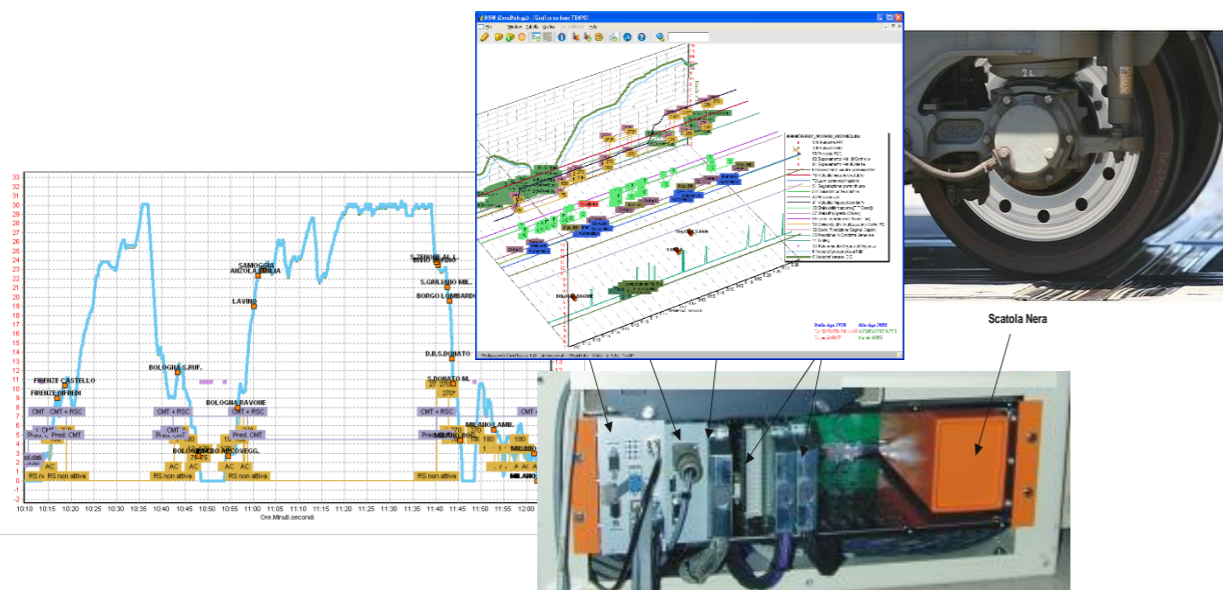
# ERTMS return of experience: main critical points (2)

## Reliability of the Onboard System

- Degraded performance in conditions of low adherence
- HW Failure
- SW debugging



- ❖ **Improvement of the odometry algorithm**
  - ✓ Wheel sensors or/and integrated auxiliary sensors: accelerometer, radar.....
- ❖ **Continuous monitoring of the system performance through:**
  - ✓ Recording of ETCS onboard data through dedicated Data Logger in each train
  - ✓ Technical meetings with suppliers on a monthly basis with the aim to analyze the main problems and identify appropriate solutions
- ❖ **Improvement of maintenance and training processes**
  - ✓ Predictive maintenance



# First application of ETCS BL3 on TRENITALIA FLEET



- ❑ **Retrofit of n.64 Locos E464** for new commercial service on the «DD line Rome-Florence» (start-up in 2020)
- ❑ **Vehicle already** ERTMS certified, currently in **commercial service on class B SCMT** lines
- ❑ **High level of Reliability** – Some residual problems with DMI SIL 2 functions, in phase of resolution

Thank you for your kind attention!