

**Satellite Technologies on the Roadmap for
New Cost Efficient Train Control Systems**





Satellite Technologies on the Roadmap for New, Cost Efficient Train Control Systems

Hitachi Rail STS is a world leading provider of signalling solutions that are based on the ERTMS-ETCS platform, which has become the de facto global standard with more than 37,000km contracted worldwide and more than 8,000km in operation. New clients that require ERTMS-ETCS technology are evolving to meet rising demand for cost-efficient train control systems by adopting satellite and IP based communication technologies.

Hitachi Rail STS Satellite based signalling covers a wide range of applications, stretching from dedicated Freight lines to Regional Passenger lines, and in the future, commuter and conventional lines.

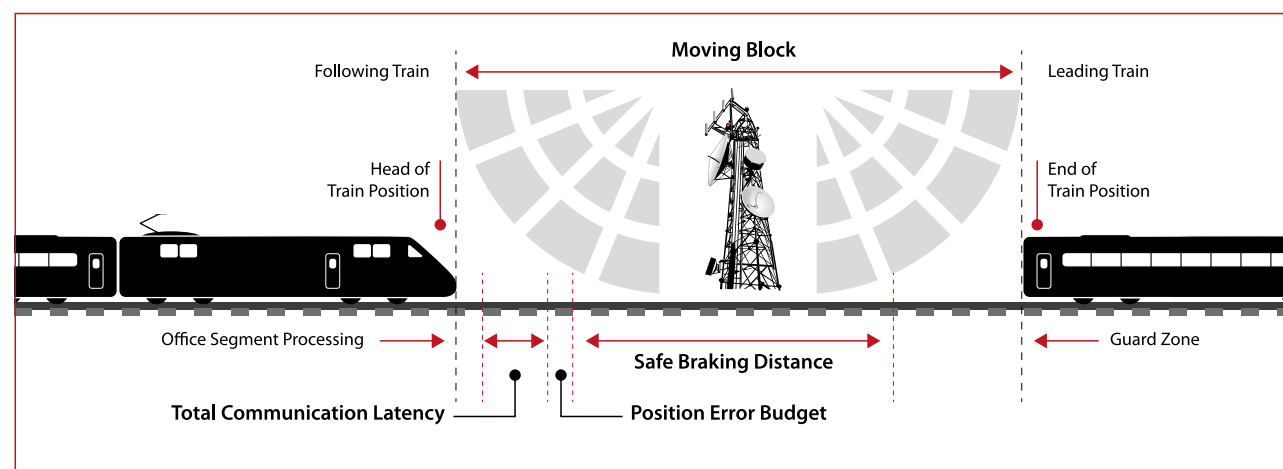
In both cases, the Hitachi Rail STS Satellite system allows for much lower Capital Expenditure when compared to traditional signalling systems due to a significant reduction of elements that need to be installed along the wayside (like light signals, balises, etc.) and the use of existing telecommunication networks (e.g. public GSM).

Long term, the lack of these elements allows for a considerable reduction in Operational Expenditure, both in terms of physical equipment and staff dedicated to maintenance, which decreases the overall system Life Cycle Cost even more.

Even with these savings, the Hitachi Rail STS Satellite signalling system still delivers the usual state-of-the-art capability in its signalling systems, both in terms of safety and required performance, thanks to a completely SIL-4 (Safety Integrated Level 4) certified system and the use of fail-safe functionalities. In addition, the use of the most up-to-date ancillary technologies, such as Satellite Train-Wayside communication in completely isolated areas, allows for great flexibility in system customization.

The ETCS system requires SIL 4 certification and the “packaging” of the new satellite technologies will guarantee the same level of safety along stretches of regional and semi desert, low traffic routes with an increase in capacity and lower O&M costs with respect to conventional signalling systems.

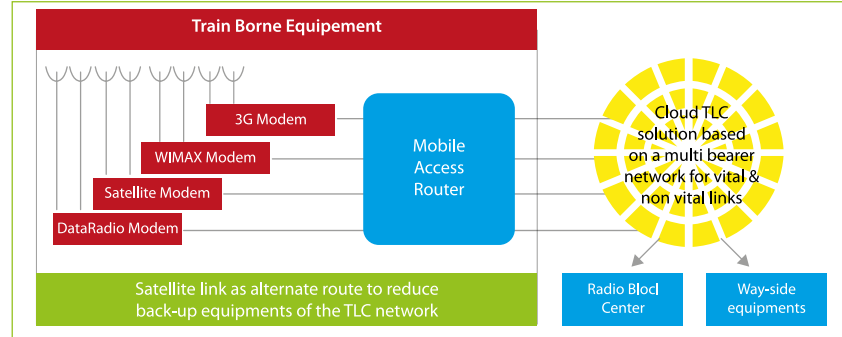
The Hitachi Rail STS solution will be based on virtual blocks, and the train spacing will be based on the braking distance of each train and is not dependent on infrastructure constraints: limits of Movement Authorities (MA are determined by the “rear of train ahead,”) or entry into next virtual block. The length of the virtual block is a configuration parameter and it can be statically changed without impacting the wayside infrastructure.





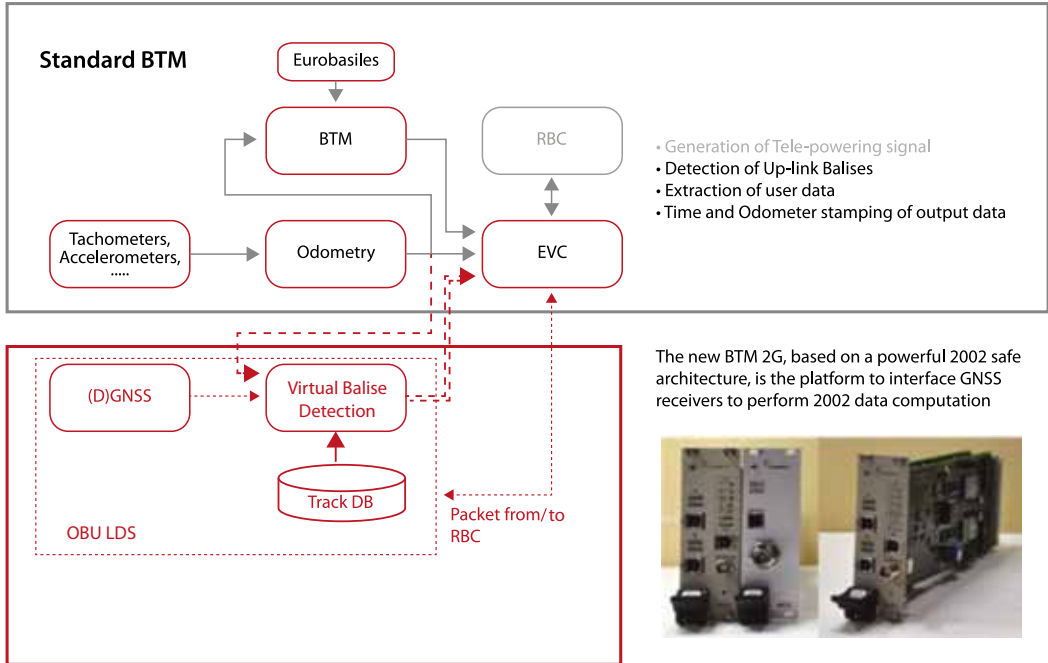
Satellite localization and wireless TLC, tightly intertwined with each other, are as important as ever for designing, constructing and operating less expensive train control systems without impacting the high safety levels achieved by the ERTMS-ETCS.

Satellite localization supports and complements traditional odometry systems for operations with a drastically reduced number of fixed balises installed along the line. TLC are becoming increasingly important with regards to the cost to deploy and operate the train control system due to the projected increase of required data for supporting new services, such as driverless automation and video monitoring of critical assets.



The multi-bearer wireless TLC solution allows the use of both public and dedicated IP networks, including satellite networks for optimising the overall architecture and achieving the lowest operational costs. The Mobile Access Router (MAR) is an intelligent device installed on board the locomotive to select the most appropriate TLC network for the communications.

The satellite Location Determination System (LDS) is a subsystem integrated within the Hitachi Rail STS ERTMS/ETCS solution. The Hitachi Rail STS LDS is composed of Wayside and On Board subsystems. The Wayside subsystem can be a Software Module that can be integrated with the RBC or the Proprietary, or a Standard External Augmentation Subsystem to be integrated with RBC. The configuration depends on the accuracy requirements that need to be met. The On Board Subsystem is based on a GNSS receiver module and can act as the typical BTM as well as the component that delivers virtual balises stored on the on board track database, or both.



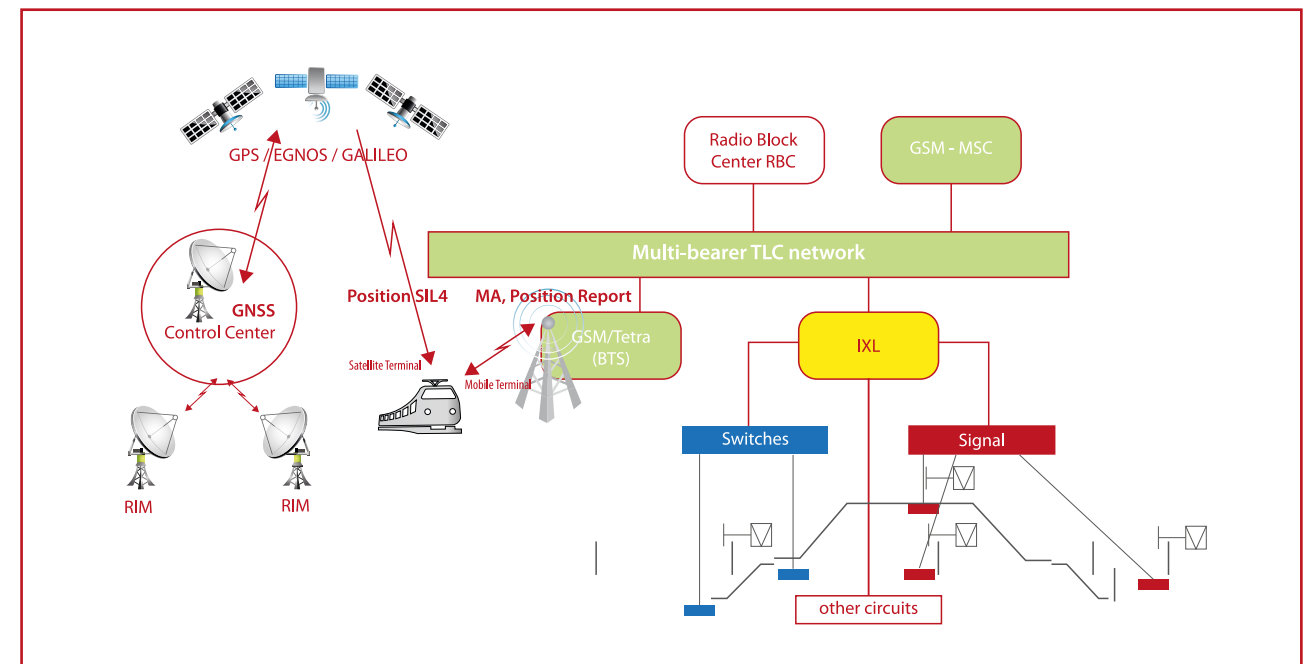
The new BTM 2G, based on a powerful 2002 safe architecture, is the platform to interface GNSS receivers to perform 2002 data computation



In order to comply with the highest safety level requirements (SIL-4), the Satellite LDS can operate with a dedicated or publicly augmented network, guaranteeing the integrity of the satellite position and the level of accuracy. Radio is the network used for ERTMS Signalling.

Hitachi Rail STS is cooperating with major satellite stakeholders, such as the European Space Agency, that have assigned Hitachi Rail STS to the 3InSat project with the GNSS Supervisory Authority.

A specific Test Site will be placed in Sardinia, on the Cagliari Oristano railway, to test and verify the satellite assets, the IP multi-bearer TLC networks and the ERTMS architecture. This Test Site will also pave the way for the validation and optimisation of the EGNOS system (and in the future the GALILEO system) in order to be adopted by the ERTMS on its evolution path.



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