Using GNSS in a safety-related application

The Italian Railway experience
More than 10 years of experience....

High Speed trains tracing & tracking

Fleet management

Lines monitoring

Feasibility and soundness to use the GNSS in rail environment, but till now limited to “commercial” applications.

For “safety related” applications, continuity of service, availability & integrity of received signals are mandatory needs.

Way to fulfill these needs:

1. Today, using GPS+EGNOS, specifically designed to improve the GNSS features, allowing applications in the transport area.
2. Tomorrow, using GALILEO Safety-of-Life service, specifically designed for applications where safety is mandatory.
A simple and Low-cost Traffic Management system

- Cheap positioning information
- Few intervention on infrastructure
- Continuous tracing of the trains, by recovering the sat signal where it is poor or missing (like tunnels, urban canyons, roof stations etc.)
The foreseen architecture

- GNSS satellites
- GSM(/R) NETWORK
- Main Control Center
- Info Systems
- On Board Equipment
The system basic functions

- **Location**: each train locates itself using GNSS and sends its position via GSM(/R)

- **Data processing**: using the received information, the central computer updates the position of the trains, evaluating forecasts and possible conflicts, and proposes the possible actions

- **Management**: the Traffic Manager takes the final decision, sending via GSM(/R) the necessary orders to the drivers, always under control of the system
On Board Equipment

- Management CPU & Memory module
- Touch screen for data display and input
- GPS+EGNOS receiver, open to GALILEO
- GSM/GPRS board (data+sms functions)
- Combined GPS/GSM antenna
- Power supply
Main Control Center

- Fault-tolerant computer system
- Redundant GSM communications facilities
- Line info (latitude & longitude for each station/notable point)
- Specific software to manage and spread data
Control room monitors

Geographic info

Train graph
Next steps … before the use!

- Certification of the used signals: it means probably the need of using Galileo, because its “legal” features (a specific Group within the GSA is working to define the necessary procedures, the involved authorities, the requested documentation,..)

- Safety assessment of the system: it means to demonstrate (as per CENELEC norms 50126, 50128 and 50129) the fulfillment of the required targets levels for
  - single components
  - sub-systems
  - applications
The best way

- A close collaboration among all the actors (Infra Managers, Operators, Notified Bodies, Safety Authorities, Suppliers) in order to agree the analysis of the safety problems and risks assessment related with the use of GNSS
- Several field testing sessions, in parallel with the existing systems, in order to get a real confidence
- A “Problem Solving” approach, to be deployed during all the test phases
Thank you for the attention

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