Argos Ingegneria S.p.A.

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Argos
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Ground Vehicles Management System (GVMS)

Pat. n° RM2007A000157, March 23, 2007

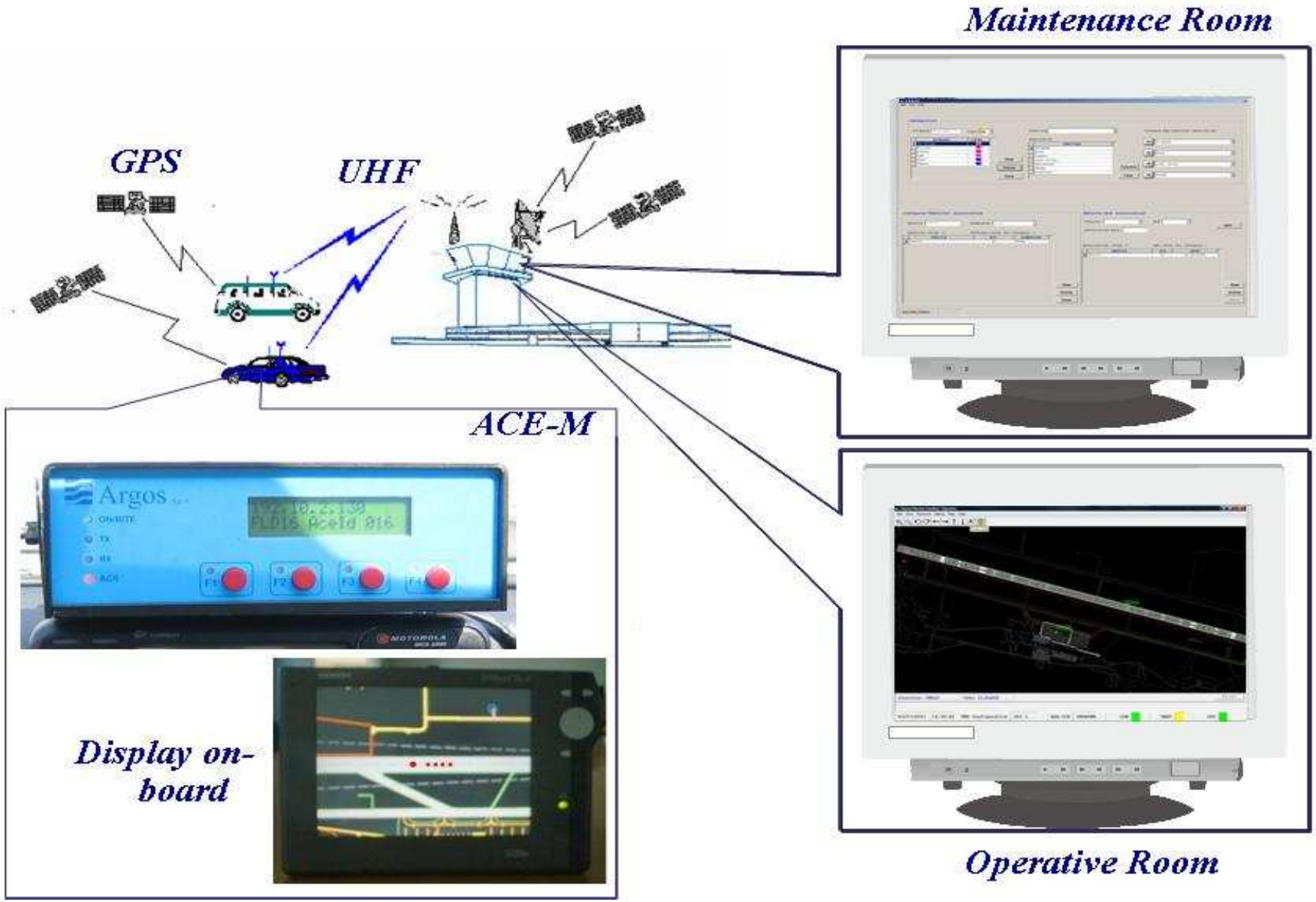
Overview

The GVMS system provides the identification and the localization of cooperative vehicles in order to:

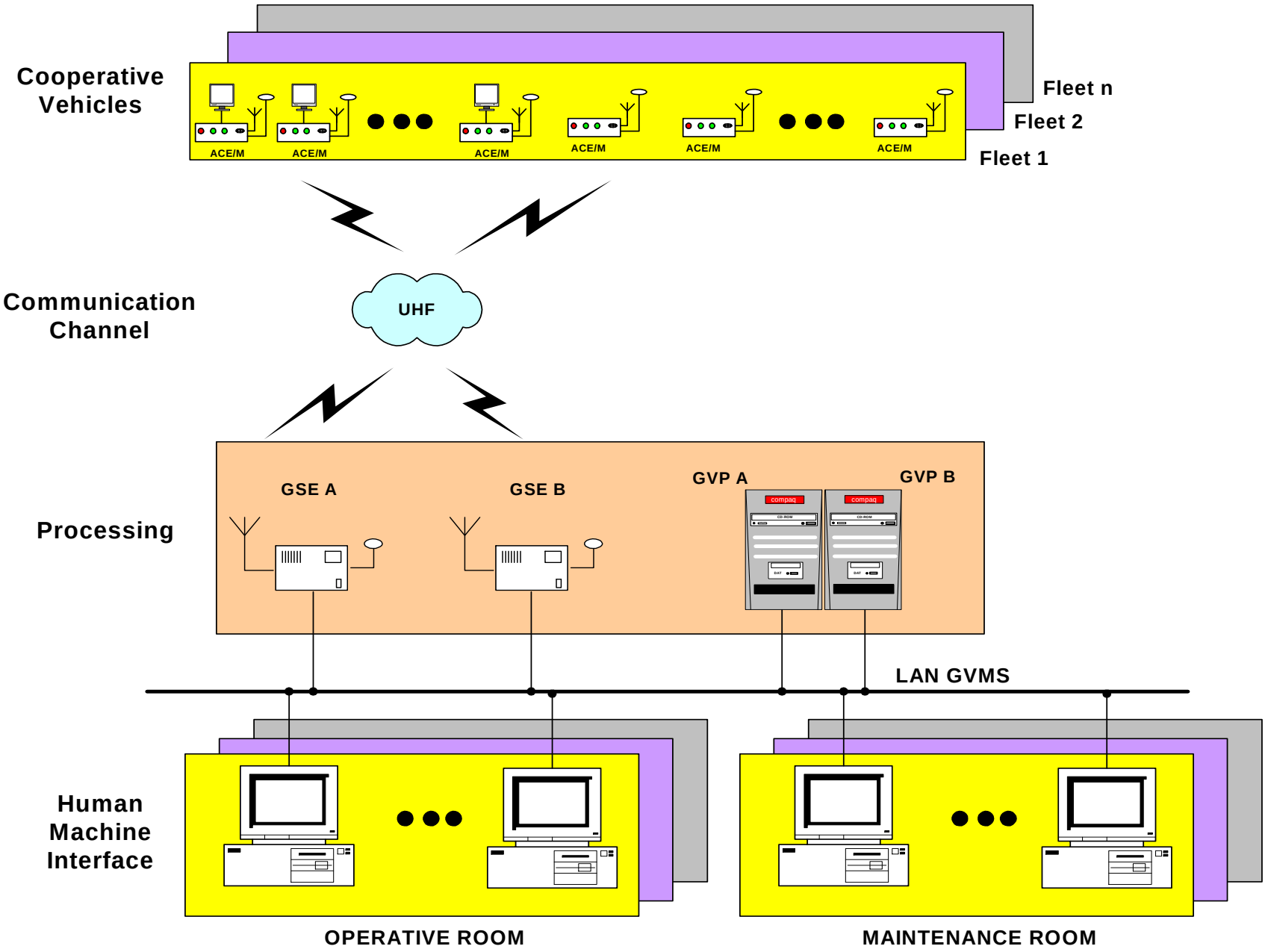
- Increase the safety and service efficiency
- Optimize the management of the available resources
- Increase the yield of the services to perform
- Improve the services maintenance and the efficiency of the resources maintenance

The GVMS architecture is realized with modularity and flexibility criteria in order to allow its integration with pre-existing Presentation systems and other level systems.

GVMS system: Overview

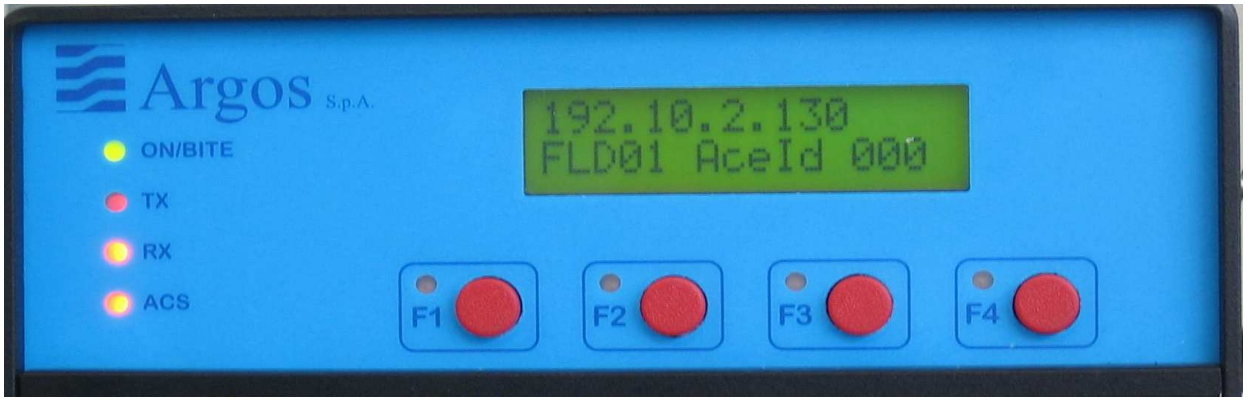


Block diagram



On-board Components: Argos Communication Equipment (I)

- Calculation of D-GPS
- 4 diagnostic LED



Weight: 1,2 Kg, Footprint: 165x60x210 mm

- On board acoustic alarm when the vehicle goes in/out predefined areas (eg. maneuvering area) and when it receives alert messages from the centre
- 4 functional pushbuttons to send to the centre the info according to the mission
- Transmission to the centre of GVMS reports with D-GPS position, time stamping and operative messages

On-board Components: Argos Communication Equipment (II)

Fixed

- UHF and GPS antennas installed of top of vehicle
- ACE/M fixed on a slide and powered by vehicle battery

This installation is suggested on vehicles in permanent use

Configured

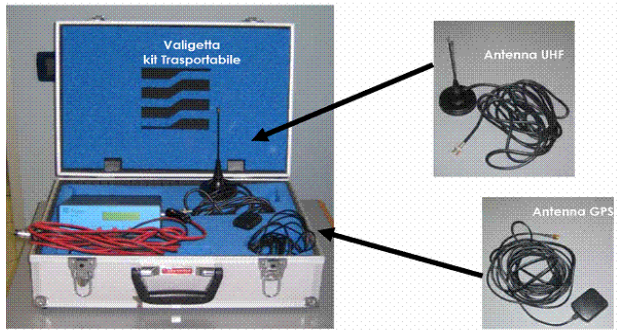
- UHF and GPS antennas installed of top of vehicle
- A slide is foreseen for ACE/M installation and powered by vehicle battery

This installation is suggested on vehicles that are used only in predetermined period (i.e. de-iceing). In case of use, an ACE/M will be fit on slide only for the time necessary

Temporary

- UHF and GPS antennas fixed on the magnetic mounting bases
- ACE/M powered by vehicle lighter

This installation is suggested on non airport vehicles



On-board Components: Argos Communication Equipment (III)

- With the functional pushbutton, at ACE/M start-up, it is possible to modify the vehicle label, upon inserting the suitable password with the following procedure

⇒ At the ACE/M Start Up, insert password in order to access the Call-Sign on Board menu

⇒ Insert the new ID for the vehicle

⇒ ACE/M sends the new ID to the centre; the ID is accepted and modified on the DataBase

⇒ On ACE/M display a new Call-Sign is shown

On-board Components: Display (I)

It is used on board for displaying on the georeferenced map the following information:

⇒ D-GPS position of the vehicle

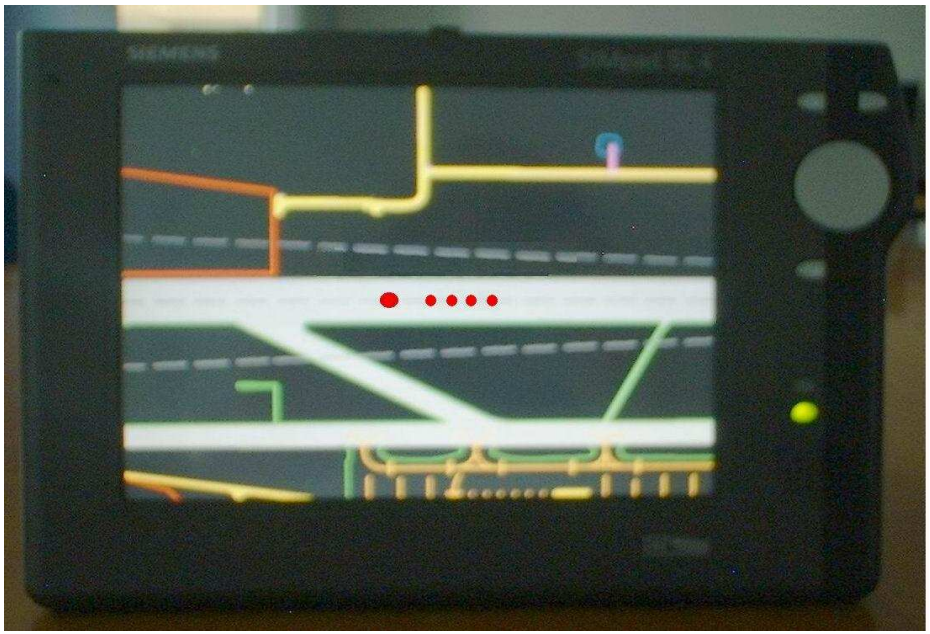
⇒ Mission points

It is used for displaying alarm messages and messages coming from the centre

It is extremely useful in critical situation as:

⇒ Low visibility

⇒ High traffic



Weight: 1 Kg

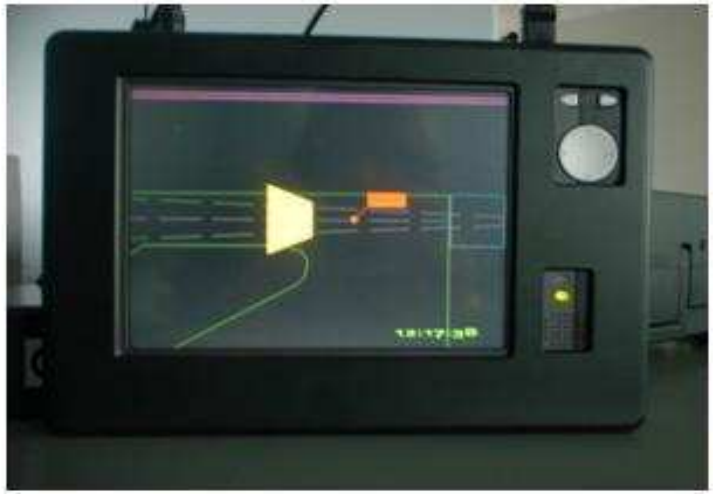
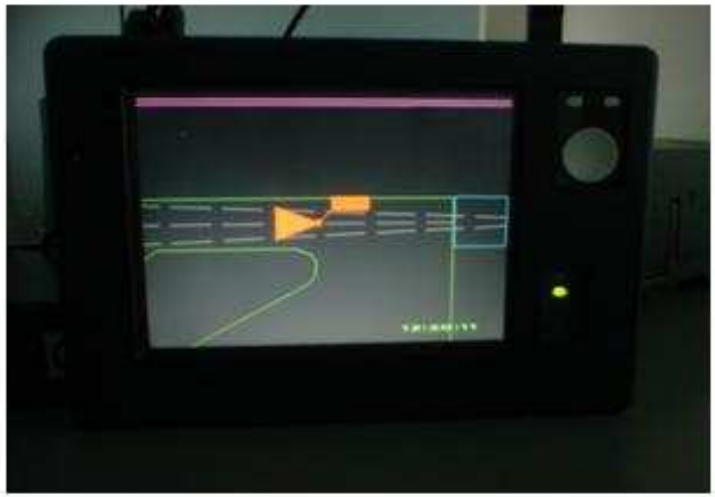
Footprint: 260x180x30 mm

On-board Components:Display (II)

It integrates the “Bubble” function that allows the driver to see the movements of the nearest vehicles.

The vehicles are displayed on the monitor by colours and shapes depending on the danger level.

An acoustic alarm occurs depending on the danger level

YELLOW ALARM Potential collision within 20 - 40m	RED ALARM Potential collision within a range of 20m
	

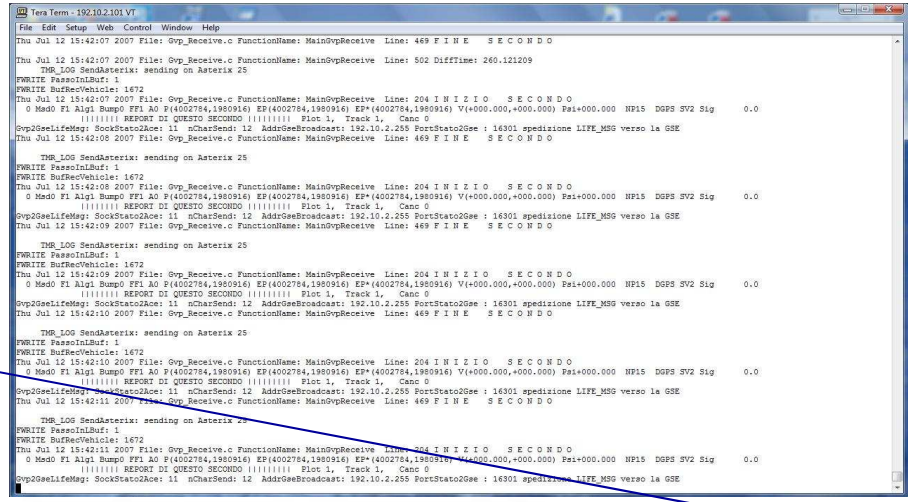
Equipment Room: Ground Station Equipment (GSE)

It consists of:

- Mono or multi UHF based Radio channel management by TDMA and super-frame technique
- Centre to field radio link to send:
  - ⇒ Service/alert messages to all vehicles or dedicated vehicles
  - ⇒ RTCM data for differential correction to all vehicles every 3 seconds.
- Field to centre Radio link to send GVMS report messages
- Messages exchanged with GVMS server are managed by TCP protocol and UDP protocol
- Redundant hardware configuration (if required)

Equipment room: Ground Vehicles Processor

- Process the GVMS report message to:
  - ⇒ Define the vehicle position through the received D-GPS point and its old points
  - ⇒ Assign a label to a vehicle
  - ⇒ Refresh of the maintenance data base when receiving a point of interest
- The output message is formatted according the UDP/TCP protocol and other dedicated formats (Asterix, ADS-99, etc)
- Redundant hardware configuration (if required)



Differential position

received UHF report

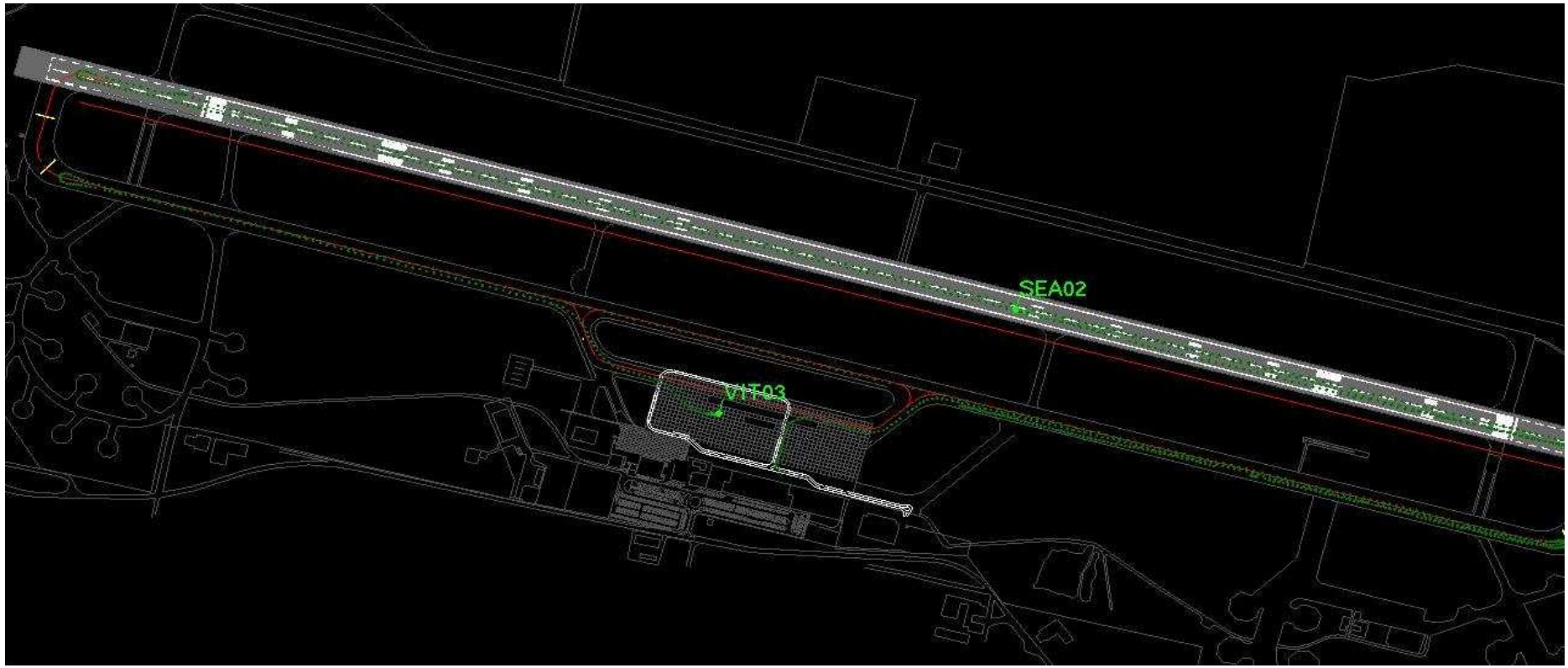
Satellite number received on board

```
     TMR_LOG SendAsterix: sending on Asterix 25
FWRITE PassoInLBuf: 1
FWRITE BufRecVehicle: 1672
Thu Jul 12 15:42:08 2007 File: Gvp_Receive.c FunctionName: MainGvpReceive  Line: 204 I N I Z I O    S E C O N D O
  0 Msd0 F1 Alg1 Bump0 FF1 A0 P(4002784,1980916) EP(4002784,1980916) EP*(4002784,1980916) V(+000.000,+000.000) Psi+000.000  NP15  DGPS SV2
          |||||||| REPORT DI QUESTO SECONDO |||||||||  Plot 1,  Track 1,   Canc 0
Gvp2GseLifeMsg: SockStato2Ace: 11  nCharSend: 12  AddrGseBroadcast: 192.10.2.255 PortStato2Gse : 16301 spedizione LIFE_MSG verso la GSE
```

Control room

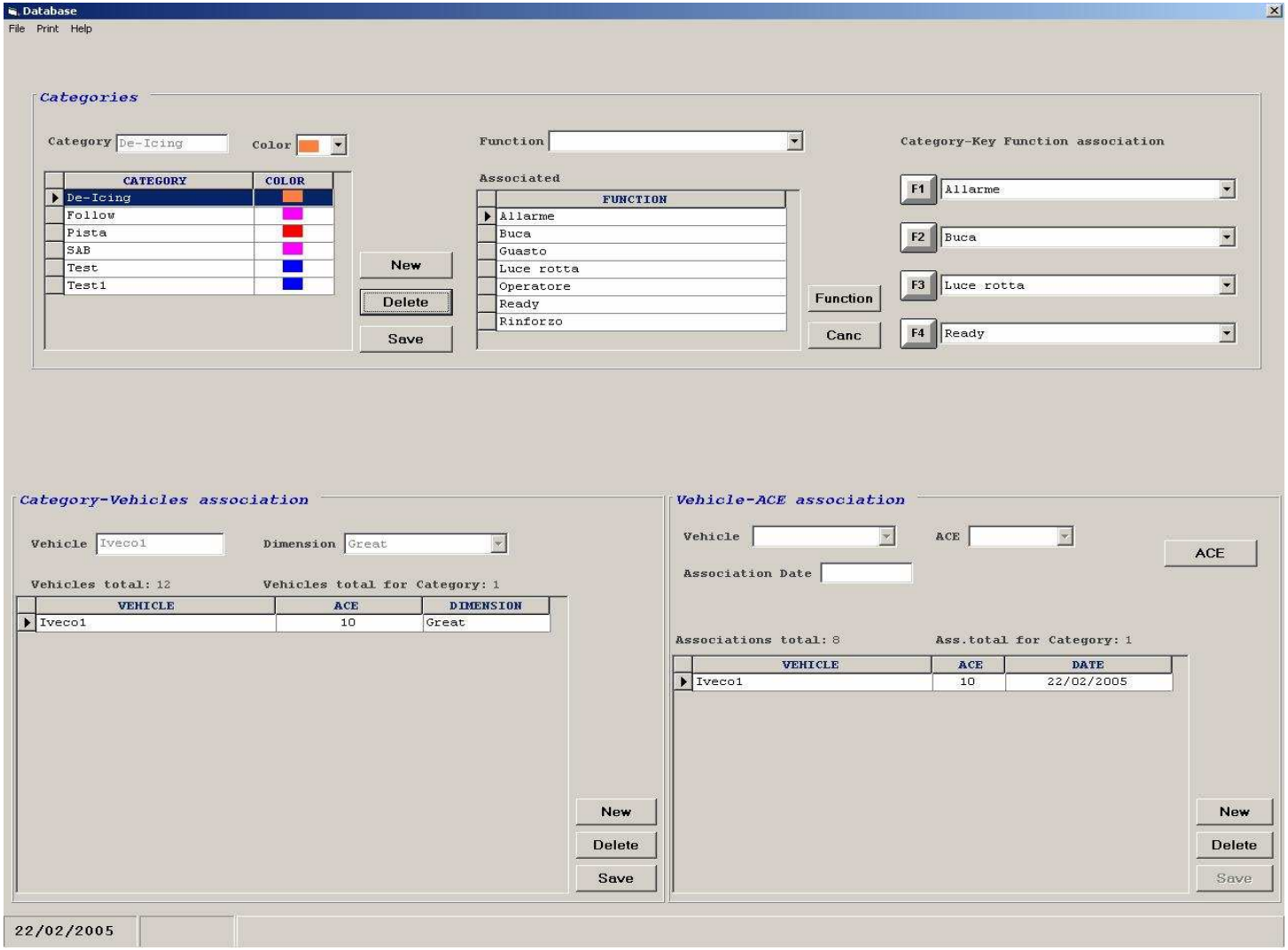
Human Machine Interface (HMI)

- Display on the map the vehicles with their label
- Display a sub set of vehicles by filter defining
- Display the messages arrived from the vehicles
- Send alarm messages and service messages toward the vehicles



Maintenance room

Human Machine Interface (HMI)

Allows:

- Vehicles data entry managed by the system (label, mission, belonging category etc..)
- Data entry and visualization of the point of interest stored in the data base
- Filters definition to display a sub set of point of interest