

# ***Argos Ingegneria S.p.A.***

***April 2009***



# *Ground Vehicles Management System (GVMS)*

Pat. n° RM2007A000157, March 23, 2007

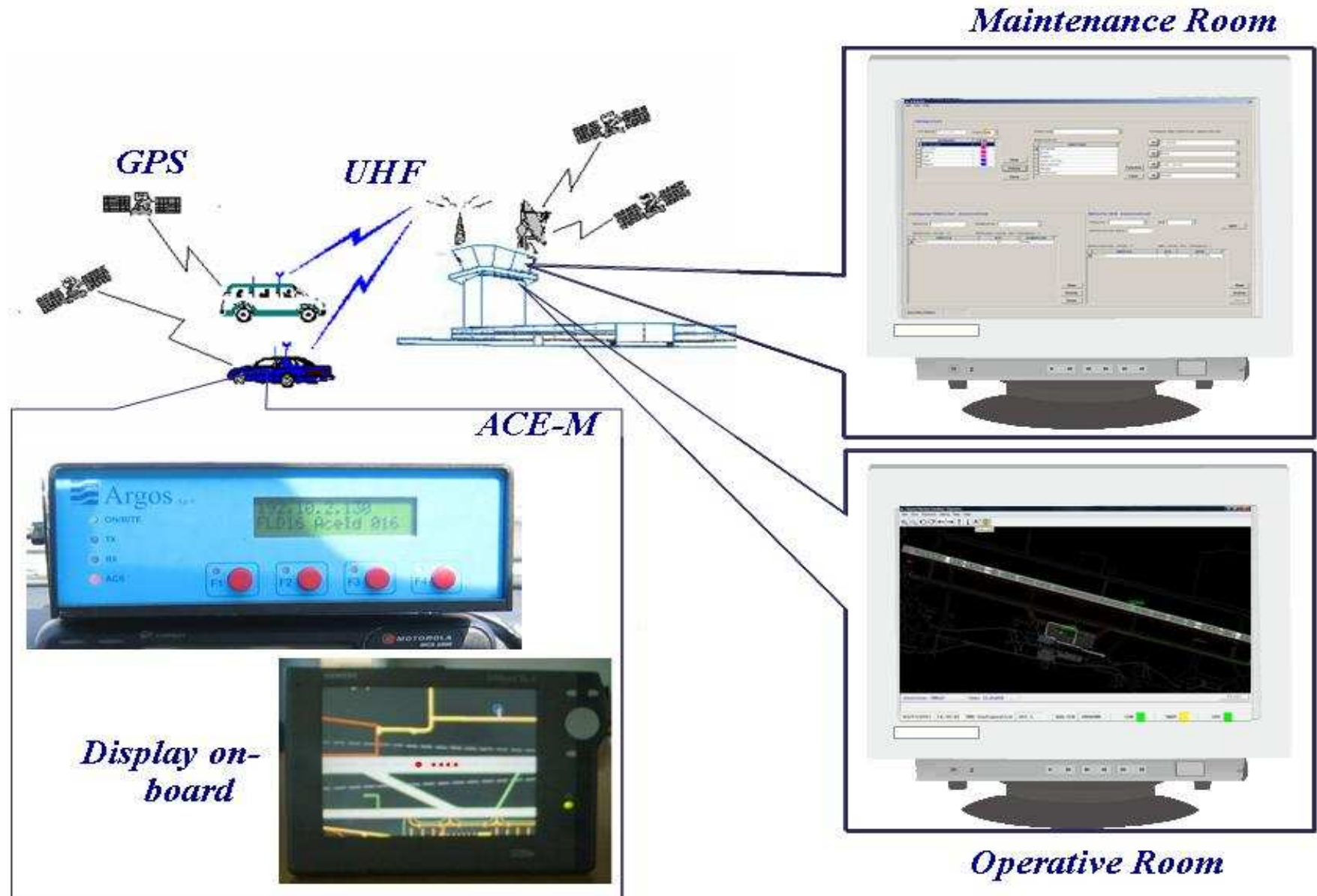
# Overview

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

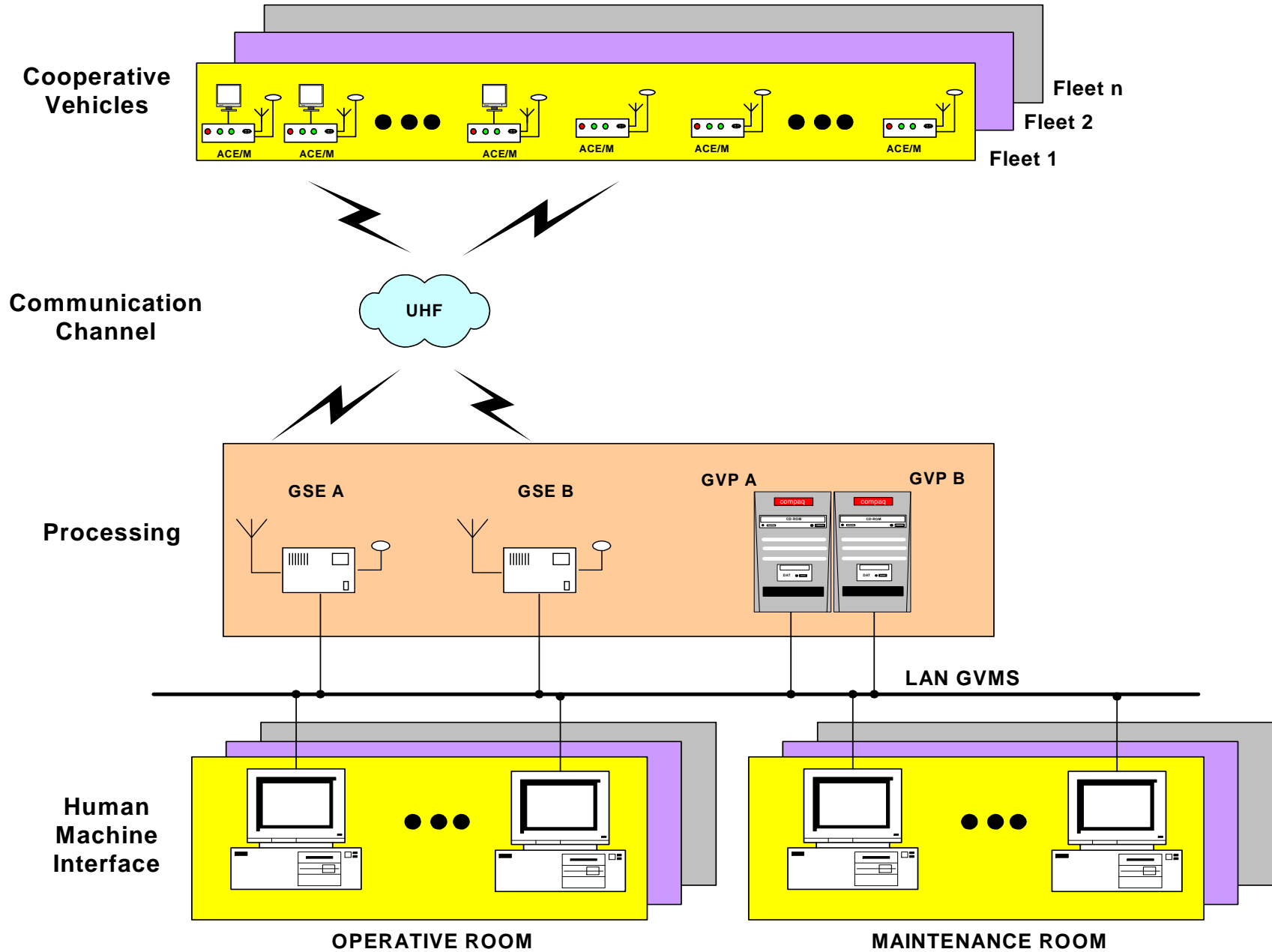
- Increase the safety and service efficiency
- Optimize the management of the available resources
- Increase the yield of the services to perform
- Improve the services maintenance and the efficiency of the resources maintenance

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 on top of vehicle
- ACE/M fixed on a slide and powered by vehicle battery

This installation is suggested on vehicles in permanent use

## Configured

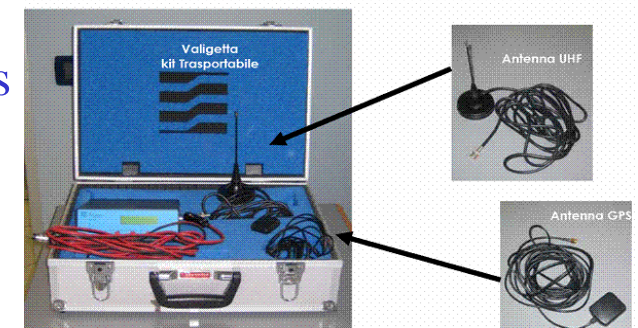
- UHF and GPS antennas installed on top of vehicle
- A slide is foreseen for ACE/M installation and powered by vehicle battery

This installation is suggested on vehicles that are used only in predetermined period (i.e. de-icing). 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

CallSign-OnBoard  
ARGOS Ingegneria

F1 -> ASSEGNA  
F2 -> DE-ASSEGNA

Digita PWD \_  
F2-> F3<- F4sped

Password OK  
Ingresso in ID .

Digita ID \_  
F2-> F3<- F4sped

Digita ID ARGOS  
F2-> F3<- F4sped

Password ERRATA  
Riprova...

Accesso NEGATO  
Uscita CSOB ...

Invio l'ID ARGOS  
in Torre ...

ID ACCETTATO  
Flash Modificata

## *On-board Components: Display (I)*

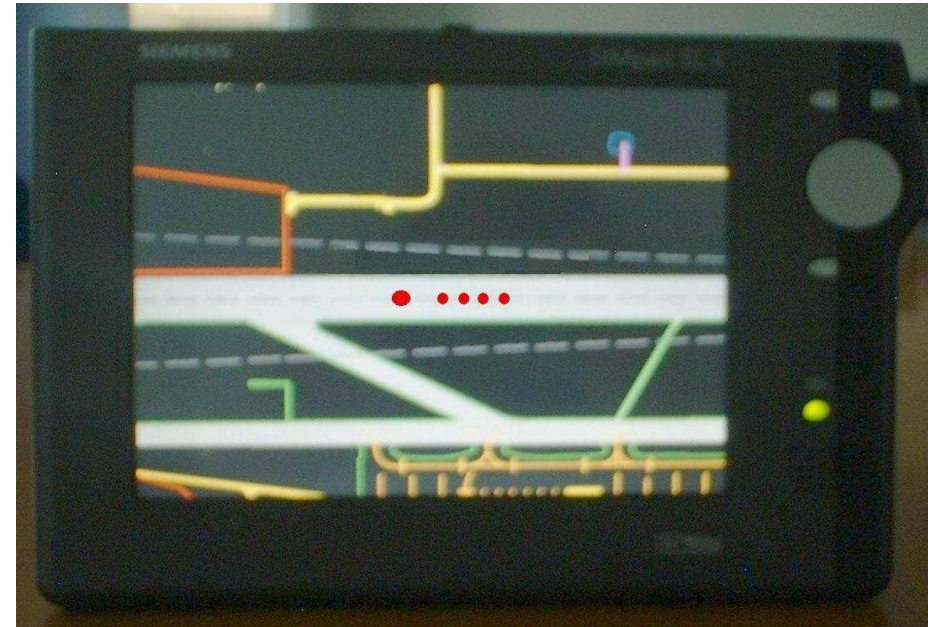
It is used on board for displaying on the georeferenced map the following information:

- ⇒ 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)*

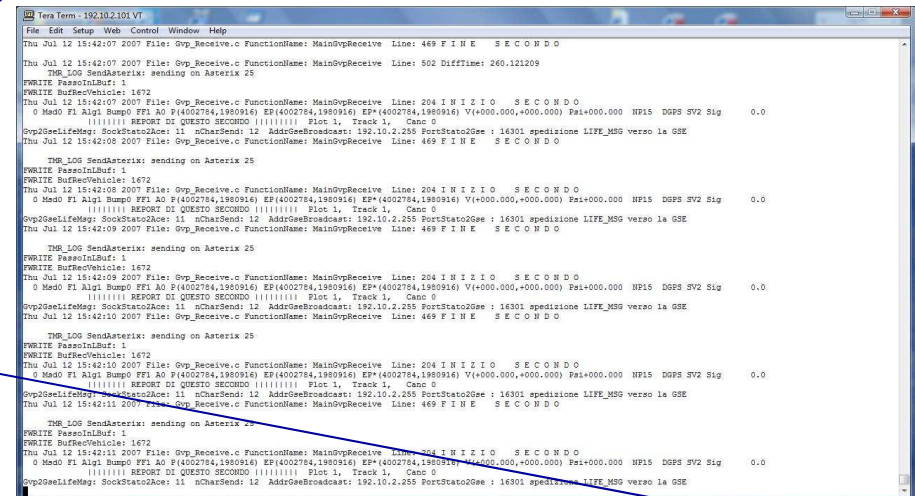
It consists of:

- 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)





- 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)



```

TeraTerm - 192.102.101.VI
File Edit Setup Web Control Window Help
Thu Jul 12 15:42:07 2007 File: Gvp_Receive.c FunctionName: MainGvpReceive Line: 469 F I N E   S E C O N D O
TMR_LOG SendAsterix: sending on Asterix 25
TMR_LOG SendAsterix: sending on Asterix 25
FWRITE PassoInLBuf: 1
FWRITE BufRecVehicle: 1672
Thu Jul 12 15:42:07 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 Sig 0.0
||||||| 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
Thu Jul 12 15:42:08 2007 File: Gvp_Receive.c FunctionName: MainGvpReceive Line: 469 F I N E   S E C O N D O
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 Sig 0.0
||||||| 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
Thu Jul 12 15:42:09 2007 File: Gvp_Receive.c FunctionName: MainGvpReceive Line: 469 F I N E   S E C O N D O
TMR_LOG SendAsterix: sending on Asterix 25
FWRITE PassoInLBuf: 1
FWRITE BufRecVehicle: 1672
Thu Jul 12 15:42:09 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 Sig 0.0
||||||| 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
Thu Jul 12 15:42:10 2007 File: Gvp_Receive.c FunctionName: MainGvpReceive Line: 469 F I N E   S E C O N D O
TMR_LOG SendAsterix: sending on Asterix 25
FWRITE PassoInLBuf: 1
FWRITE BufRecVehicle: 1672
Thu Jul 12 15:42:10 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 Sig 0.0
||||||| 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
Thu Jul 12 15:42:11 2007 File: Gvp_Receive.c FunctionName: MainGvpReceive Line: 469 F I N E   S E C O N D O
TMR_LOG SendAsterix: sending on Asterix 25
FWRITE PassoInLBuf: 1
FWRITE BufRecVehicle: 1672
Thu Jul 12 15:42:11 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 Sig 0.0
||||||| 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
  
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Differential position

Satellite number  
received on board

received UHF report

TMR\_LOG SendAsterix: sending on Asterix 25

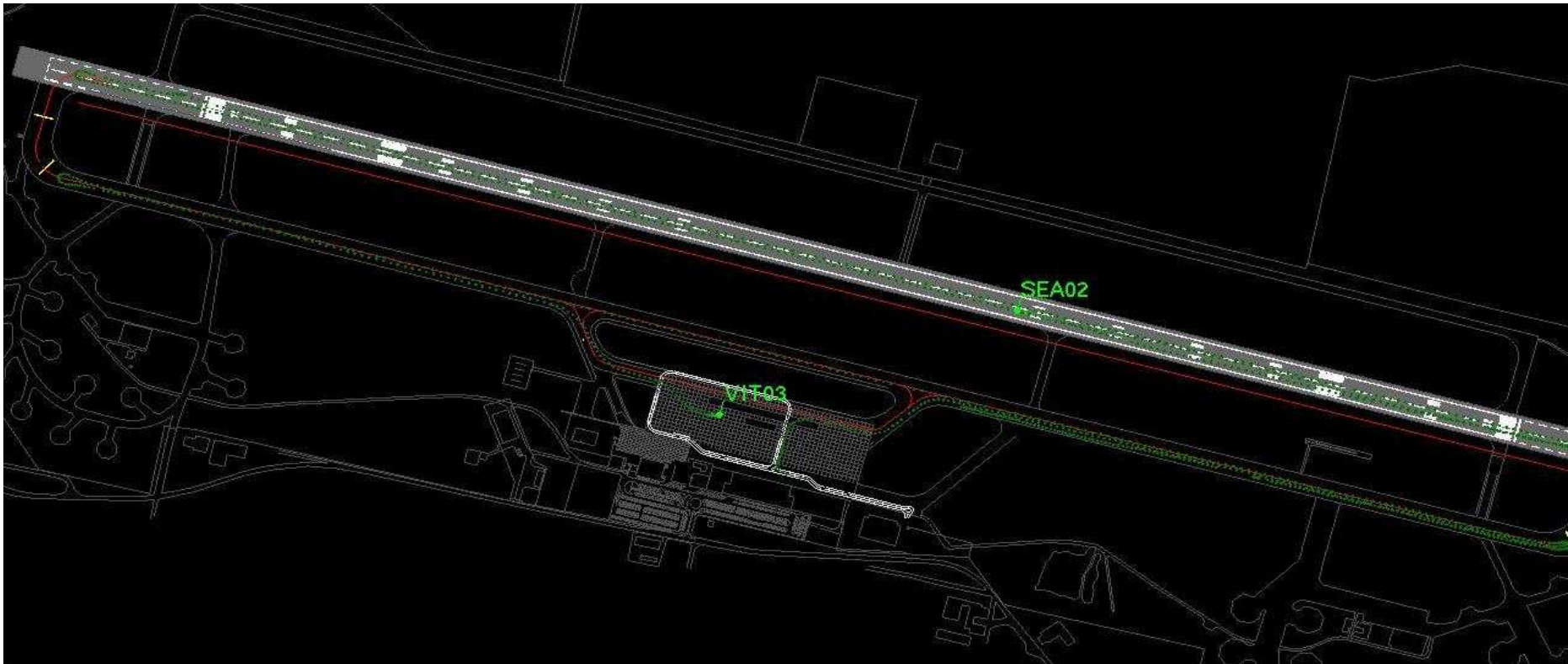
FWRITE PassoInLBuf: 1  
FWRITE BufRecVehicle: 1672

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



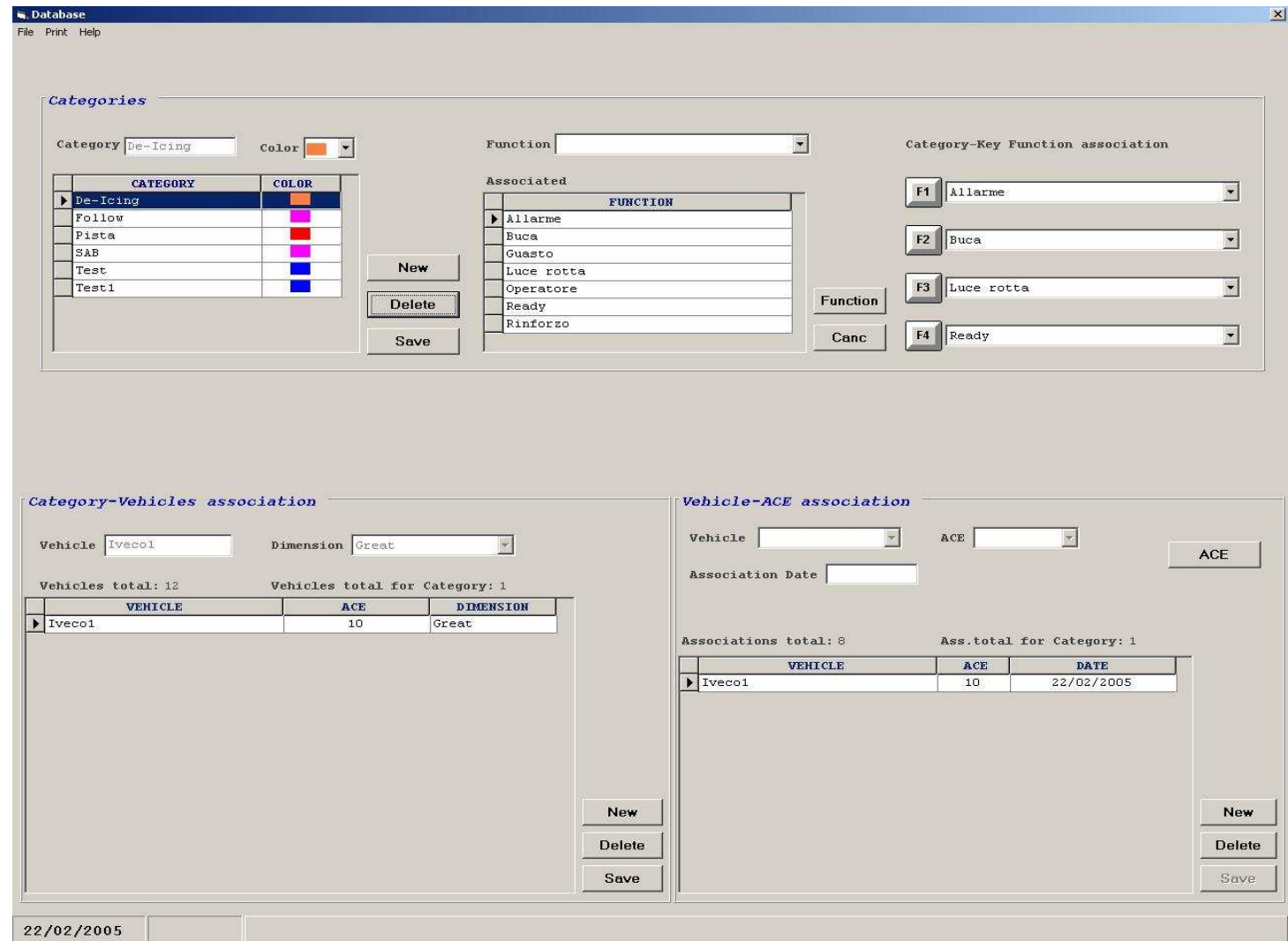


# Maintenance room

## 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



The screenshot displays a software interface for a database, titled "Database" with a menu bar (File, Print, Help). The interface is divided into several sections:

- Categories:**
  - Category: De-Icing, Color: Orange
  - Function: (empty dropdown)
  - Category-Key Function association: F1 Allarme, F2 Buca, F3 Luce rotta, F4 Ready
  - Associated FUNCTION list: Allarme, Buca, Guasto, Luce rotta, Operatore, Ready, Rinforzo
  - Buttons: New, Delete, Save
- Category-Vehicles association:**
  - Vehicle: Iveco1, Dimension: Great
  - Vehicles total: 12, Vehicles total for Category: 1
  - Table:
 

VEHICLE	ACE	DIMENSION
Iveco1	10	Great
  - Buttons: New, Delete, Save
- Vehicle-ACE association:**
  - Vehicle: (empty dropdown), ACE: (empty dropdown)
  - Association Date: (empty text box)
  - ACE button
  - Associations total: 8, Ass.total for Category: 1
  - Table:
 

VEHICLE	ACE	DATE
Iveco1	10	22/02/2005
  - Buttons: New, Delete, Save

The date 22/02/2005 is displayed at the bottom left of the interface.