

# MATRICES-AVM

CYBER SECURITY DIVISION

## Mass Transit Complete Solution

Automatic Vehicle  
Monitoring

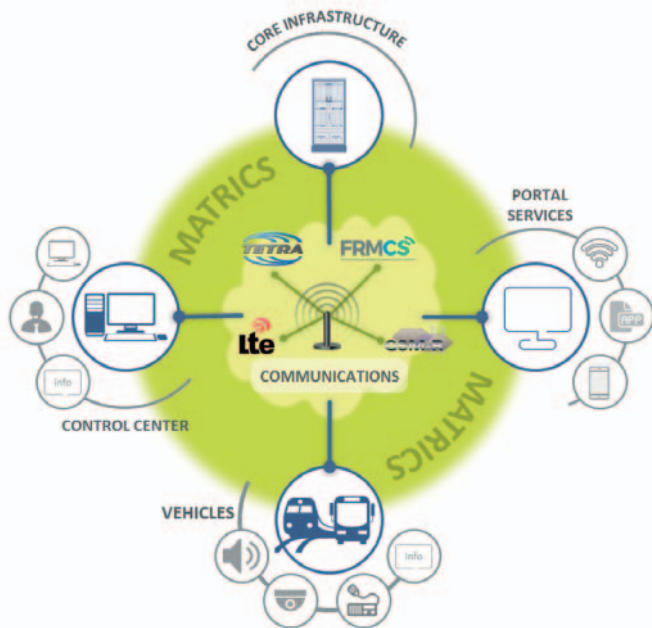


One of the main goals of public transport network operators is that of providing the public with a reliable and well planned service that offers a viable alternative to private means of transportation.

Among the key requirements for the accomplishment of this goal are an easy supervision and regulation of the service, optimized management of the vehicle fleets, correct scheduling of route timetables and the provision of clear information to the users.

**MATRICES-AVM** is Leonardo complete suite for public transport management specifically designed to manage a surface fleet based public transport in a simple and effective way, providing the operator with powerful and clear representations of the service, together with highly effective tools for regulating service.

MATRICES-AVM is built on a distributed, flexible and robust architecture where vehicles equipped with ancillaries and local intelligence communicates via private or public networks with the operation center performing real time monitoring, management and regulation functions as well as multi-channel information dissemination for users.



## KEY POINTS

- > Turnkey solution both at central and peripheral level
- > Modular platform for easy and effective fleet management
- > Traffic regulation management functions availability
- > Smart Apps for on street operators
- > Advanced operational reporting measuring service quality
- > Multi-channel information to passengers.

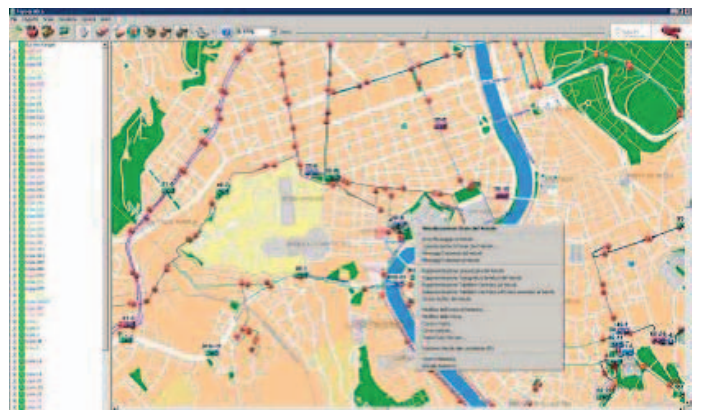
## AVM CONTROL CENTER

AVM Control Centre collects data from vehicles and depots and monitors the services in real-time, detecting delays with respect to timetables, checking the operative status of all the vehicles and providing operators with the a wide range of functionalities for monitoring, communicating, and planning, practically all is required for the management of a modern public transport network.

- > Automatically imports the Service planning data (routes, lines, journeys, vehicle shifts, etc.) from Agency premises and transfers processed data to the vehicles.
- > Automatically imports data collected by vehicles during the service to be used to process performed service.
- > Performs vocal and digital communications with vehicle driver and central/peripheral operators.
- > Receives and handles the location and event information sent by each vehicle, in correlation with the defined route and schedule, in order to efficiently plan the vehicles operation [Location Based Services].
- > Clearly provides to the central operators all the available information about lines and vehicles, both in map-based and tabular representation, helping them to identify the best actions to regulate the ongoing service, and actuate them by using the provided highly specialized tools for service management [Fleet Management]
- > Automatically archives service data and provides periodical detailed service reports
- > Imports/exports on-line data from/to external Systems.

AVM Control Center provides an intuitive and simple to use graphical user interface with map-based representations as well as tabular availability that can be easily customized according to user requirements to provide advanced support in:

- > Monitoring the service
- > Regulating the service
- > Archiving and reporting
- > Configuring the service.



# AVM ONBOARD SYSTEM

Leonardo onboard intelligent unit provides an intelligent solution for local functions management centralizing in a single platform acquisition, communication, subsystem management up to surveillance.

## NOBU

NOBU is Leonardo's MATRICS-AVM onboard intelligent unit, which provides the intelligence and the communication with the Operation Centre and with all the onboard devices.

NOBU has many built-in devices (GPS, Wi-Fi, UMTS, etc.) and so many communication interfaces (GSM/UMTS, Ethernet ports, serial ports, digital inputs and outputs, CAN FMS2, etc.) that makes it a very versatile system offering a lot of features in a very small and light package.

Its integrated GPS receiver provides accurate measurement of the vehicle position. Up to 2 data GPRS/EDGE/UMTS/HSxPA and GPRS voice modems can be provided in order to communicate with the Operations Centre by voice call or data transmission. Up to 12 Ethernet Interface 10/100Mb/s Standard 802.3af can be provided, up to 8 of them can be PoE. NOBU is compliant with EBSF (European Bus System of the Future) and respects Mass Transit de facto standards.

## ONBOARD VIDEOSURVEILLANCE

NOBU can enable on-board video surveillance features controlling video cameras, video recorder and optional real-time streaming to control Centre. Internal events (speed limits, malfunctions, etc.), as well as driver generated events and alarms, can be automatically sent to the Control Centre.

Bus path deviation events can be monitored as well. Information collected by NOBU can be remotely managed by Leonardo SC2, the platform specifically designed for Situation Awareness and Resilience, able to support security control room operators in an efficient management of ordinary and critical situations.

## SMART DRIVER TERMINAL (NG-OP-AVM)

NG-OP-AVM is the new Leonardo's MATRIX-AVM Smart Driver Terminal, connectable with NOBU. It is homologated for automotive use, small sized, suitable for easy mounting on the dashboard at the driving position and specifically designed for assuring an easy and effective interaction between the driver and the Operations Centre. NG-OP-AVM has a 7" color touch-screen display, which typically provides service information to the vehicle driver and diagnostic indications to maintenance personnel.

The wide viewing angle and configurable brightness ensure excellent viewing in all light conditions. Additional external buttons allow the operator to perform quick operations.

New Leonardo's MATRIX-AVM Smart Driver Terminal, leveraging its powerful processor, huge memory and the optional hardware communication components can integrate in a modular way such functionalities as:

- > Fleet Management Functionalities
- > Can Bus functionalities for Bus Maintenance

- > Video Surveillance Capabilities (up to maximum 2-4 digital cameras connected via external switch).

In cooperation with the NOBU or providing a compact-entry level alternative.



On-board unit [NoBU]



Videosurveillance on-board camera



On-board Operator panel

## INFORMATION TO CUSTOMERS

MATRICES-AVM solution include a rich set of tools to provide detailed information to passengers and customers.

**AVM onboard system** is able to manage:

- › on board line indicator displays, indicating the line number and the current destination of the vehicle. The next destination is automatically updated at the arrival of the destination terminus
- › on board stop announcer displays, indicating the current stop and next scheduled, along with any operational message coming from the central system.
- › all the displayed information can be announced vocally via native text-to-speech to internal/external loudspeakers.

**AVM central system** is able to automatically manage Smart Stops, sending forecasts of arrival /departure time of the vehicles, operator's messages sent by the Central System operators, real-time information produced automatically by the system in consequence of special service events or anomalies, current date and time.

**AVM Portal** can provide schedules based on static service information, real-time forecasts provided by AVM Central System, operator's messages regarding the ongoing service.

**AVM App** for Bus Customers can provide forecasts provided by AVM Central System, the positions on the buses. And information about the ongoing service. AVM App is available for Android and IOS.



*Electronic smart bus-stop*



*On-board equipment's inside driver cockpit (positioned on top driver seat)*



For more information please email:  
[securityandinformation@leonardocompany.com](mailto:securityandinformation@leonardocompany.com)

Leonardo S.p.a.  
Via Puccini, 2 - 16154 Genoa - Italy  
Tel. +39 010 65821  
Fax +39 010 6582898

[leonardocompany.com](http://leonardocompany.com)

This document contains information that is proprietary to Leonardo - Società per azioni and is supplied on the express condition that it may not be reproduced in whole or in part, or used for manufacture, or used for any purpose other than for which it is supplied.

2020 ©Leonardo S.p.a.

mm09061 03-20

 **LEONARDO**