SYSTEM

vodafone
Partner

Ticket Issuing System

&

GPS bus tracking in the territory

On board system and Central information system

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THE COMPANY

Our company has twenty-years experience in the field of ticket issuing system, with a particular attention dedicated to the road passengers transport.

The project was born in 2013, and in 2016 it was decided to create a new company which became a Vodafone's partner. The aim was to develop and establish a new project in order to improve and replace the old ticketing systems by satisfying the growing needs of the transport companies to acquire new equipment which fulfil the Ministry of Transport legislations. In this way it was possible to respond to the urgent requirement to control the costs without renouncing to the flexibility, quality, ease of use, compression of spaces and ergonomics.

So the x-system family sees the light with the all-in-one and "plug and play" units. Inside, the devices have incorporated the "bus system" management units, the printed ticket issued, the chip-card management and reader system, the GPS system, the colour touch screen, the magnetic tape readers, and the GPRS connectivity, which is the possibility to keep the ticket machine always connected to the company's server and to the "cloud". Today, our "tag-bus" software which is installed in more than 3000 buses, is going to be replaced by the new web oriented version. This union creates our new ticketing system.

Ticket issuing system

The ticket issuing system is composed by:

- On board system;
- Box office and external point of ticket sales system;
- Ticket sales via web by internet connection or by IOS- Android app;
- Application software management of the front-office and back-office system
- Smartphones app.

The provided system allows the ticket issuing , both the paper and the electronic contactless type. They are in compliance with the ISO 14443 standard, type B.

The system which is intended as a hardware and software devices is described below.

On-board vehicle system.

The device is composed by a X-9000 multi-function terminal. It is equipped with a high calculus power, compact and made with a plastic shock absorbent material. It's technical characteristics are:

- 32 bits ARM 9 Microprocessor (450 Mips)
- 64 M SDRAM + 128 Flash Internal Memory
- TFL – LCD Touch Screen Display transmission from 3,5'' QVGA 240x320 pixels, 256K color.
- Physical keyboard + touch screen with 16 backlight keys
- 30 I/sec thermal printer
- 3 ISO tracks magnetic tape card reader
- Microchip reader, standard smart-card
- ISO 7816/A-B EMW L.1 Certificate contactless
- GPRS, GPS, Bluetooth, Wifi Connectivity
- Terminal Connection: micro USB (type A/B host and slave)
- Audio: Buzzer Speaker
- 2.050 m Ah Li-ion Battery
- Dimensions: 150 x 78 x 44 mm
- Weight: 285 gr.

On board bus installation

The automatic ticket machine will be installed through a specific assembly kit which includes:

- A specific support structure that is attached to the bus console. In this way the terminal is easily removable for a portable version use.
- A power supply charges the internal system battery

It does not require an ”invasive” system on the vehicle, and it does not change the lay-out of the bus. In summary, two screws, the connection with the power supply and the game is up.

An only one connection, in case of request, by using a LAN cable on-board, in order to install a ticket machine near the doors, in a classic version, behind the bus driver. More than one system could be connected near the doors to the driver’s terminal .

Ticketing system

The ticket sale point is the main Office in which the sale and/or the validation of the electronic and printed ticketing issue are carried out. A supervised single site where employees are authorized to sell tickets directly.

At this point the staff will use the X 220 terminal to sale the tickets, for purchase verification, and to continue with the ticket issuing by showing to the users all the purchasing opportunities.

The X200 terminal renews the pass chip card and top-up the electronic purse. The single tickets are printed in a 70grm/m classic paper form with an identification code composed by a QR-code reader. On the bus, the ticket will be validated at the central system. It will be always internet connected through on board terminals.

Thanks to a specific terminal, the verifier will check date and time of the sale and ticket printing control.

Verification System: The electronic ticket validation

The X-600-QR-Code system is an electronic ticket validation which uses a contactless card reader. It is one of the most innovative system in the market, and it is used by many transport companies as Calypso, all editions of Milfare, and Sik2-cless.

It is characterized by a sturdy anti-burglar protection structure, with a simple interface easy to use. It is equipped with a color backlight display and a QR-Code reader which allows to use the validation in every kind of illumination condition. The system is able to handle every smart-card type thanks to a wide memory, several interfaces and to an incorporate universal card reader.

Moreover, it is remote controlled, through a remote management system. So it gives the opportunity to supervise the conditions concerning all devices installed on the bus and to act with few actions in order to carry out the updating process.

VM-X Vending Machine

The VM-X selling system can be externally installed. It issues paper tickets with QR-Code, magnetic strip and/or pre-coded or coded contactless smart card on the spot. It accepts coins and banknotes payment with change, credit and prepaid cards and it can be used to top up smart cards.

The system is characterized by a sturdy anti-burglar protection with a 8mm thick safe cash machine and an automatic lock down portable cash box.

VM-X offers an unbeatable price/quality ratio. It is equipped by a colour touch screen and a easily understood software.

VM-X is provided by a control web system that allows to check the evolution and the status of the collection, and every kind of needs such as to fill or to empty the cash register. It is able to renovate all kind of parameters like fare and app. updating.

Moreover, VM-X is capable of sending up to six different mobile numbers out of paper, network failure and attempted breaking text messages.

On board system functions

The on-board system develops the following roles:

- The function of selling tickets on board;
- Function of localization;
- Ticketing system function;
- Online ticket validation function ;
- Communication function;

Function of selling ticket on-board

The function of issuing and selling tickets on board are developed by the driver's console.

Function of localization

The aims of the function localization are:

- To set the identification number of the current charging area;
- To set the identification number of the current bus stop that shall be remain valid until the next bus stop.

Fig. 01
Bus stop graphical representation, timetable included.

The role of the localization function is to provide the geographic coordinates of the single bus stop and its intended passage. The localization function is directly connected to the GPS "embedded" tracker

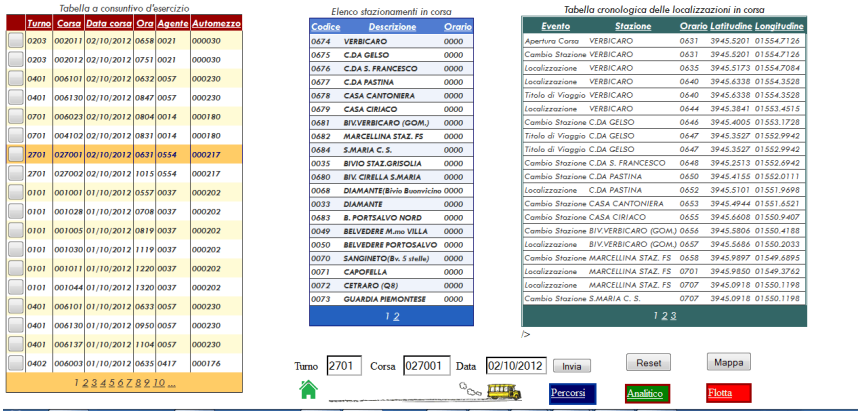


Fig. 02 Report of the bus race which includes the substantial data for validation (bust stations, stops schedule, localization activity charts)

Moreover, thanks to the connection of the diver console to the web server, it is possible to establish and examine the position of the entire bus unit on the territory in real time.

It is also possible for passengers to observe the position of the arrival bus all over the regional bus network with any type of device connected to the internet and thanks to the infomobility module.

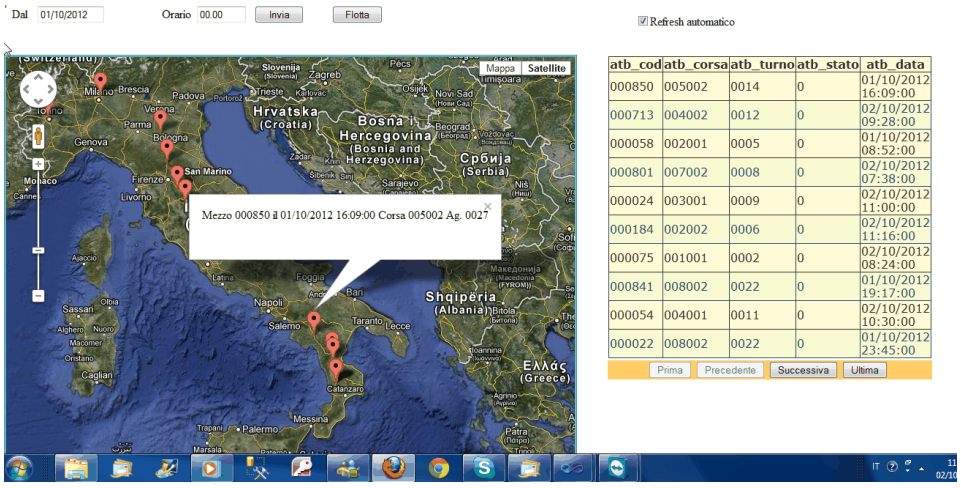


Fig. 03 Graphical representation of the "in moving" unit

Conveniently analyzed, these information are used to set the route of every single race and their validation too (fig. 02)

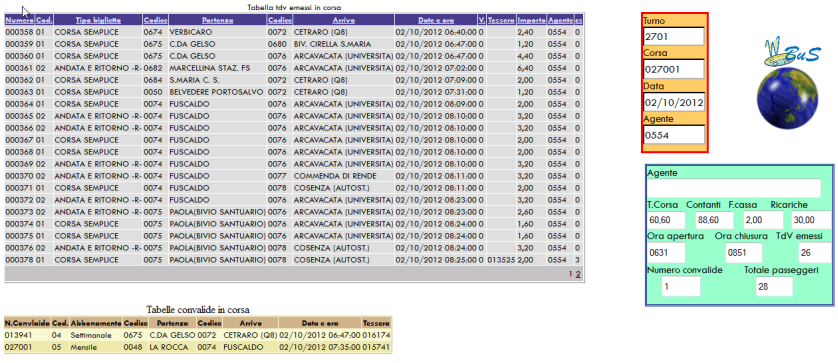


Fig. 04 Analyzed report of: routes, sold tickets, issuing and cashing conditions.

Ticketing system function

The driver console executes the issuing function by providing printed tickets, electronic tickets and passes. It permits their validation (Dual Mode)

In addition, it is possible to issue the tickets through the previously topped up of the electronic purse.

The central system send the necessary information to the driver console in order to fulfill all functions indeed:

- Qualified agents files;
- Ticket type files;
- Parking list and geographic localization files

Every bus stop file record includes the following information:

The number of the bus stops;

Four geographic coordinate couples for the identification of the charging area in both route directions;

Radius expressed in meters around the bus stop in which it is considered that the vehicle is at the bust stop;

Geographic point.

- Work shift files and bus routes

  Number of the work shift;

  Duration of the bus route;

  List of the routes and their estimated time;

  List of the transfer out of the route (service relocation).

- Files of service to establish the tariffs
- File of the vehicle list
- Blue and Black list of the ticket
- Necessary “Minors” information for the performance of the job

Interface with the driver

The aims of the driver interface functions are:

- Agent identification;
- The acquisition of the in use vehicle code when it is not automatic;
- The preparation of the vehicle original data;
- Planning and starting work schedule with the automatic bus route period;
- Integration of the extra route shift;
- Manual change station in case of the GPS is not available;
- Refueling integration – these operations are allowed just because the company server controls the suitability. For every kind of discrepancies, the authorised staff will be immediately informed.
- Closing route and shift operation.

Ticket validation function

The aims of the ticket validation function are:

- To make available the consumption of the contactless ticket and updating them in line with their use;
- To reject the sold out, expired, blacklisted, or used out of the permitted geographic ticket areas;
- Providing to the passenger all information concerning the above mentioned information;
- Collecting the relative transactions to the ticket use;
- Check in / Check out function in order to set the price of the ticket which is on boarding and alighting validated and paid with an electronic purse

Online ticket issuing function

Selling on the company website

Thanks to the ticket-on- web function all passengers will have the possibility to check for all bus routes made by every single bus and their connections. So it could be easy to achieve every destination, to establish the price, to make the ticket buying process, or to renew a pass with a smartcard. These operations are going to be possible through credit card or prepaid credit card payments but they have to be approved to make online ticket purchases. Concerning the electronic tickets, when the payment will be done, the sale figures will be automatically transmitted to the central server. In real time the central server system will make the e-tickets available for all on board bus devices. While in the authorized ticket offices, it will allow their upgrade on smart card since the first use.

The modality of the selling data transmission to the different online ticket companies is adaptable and comparable with every on board and off-board device

External point of sale

The passenger can buy his/hers own ticket in one of the authorized sale points present all over the national territory.

Communication Function

Communication on board

The aims of the communication functions on board are:

- To allow to the driver console the GPS sending data that elaborates the data without any interruption in order to identify the charging area;
- To allow to the driver to learn particular operating conditions

On-board to ground communication and vice versa

The aims of the on-board to ground communication (and vice versa) are:

- To allow the file and/or command transfer from the central system to the driver console and vice versa;

The following points in particular are set out:

- To allow to the "base" to send messages and instructions to the driver through the on-board system;
- The download of the transaction files resulted from the issuing machine;
- Loading of the set up, of the rate table charts, of the bus routes and bus stops, of the issued tickets and of the time parameters in the on-board issuing machines;
- Loading of the updating software in the on-board issuing machines.

The on-board to ground (and vice versa) communication can occur:

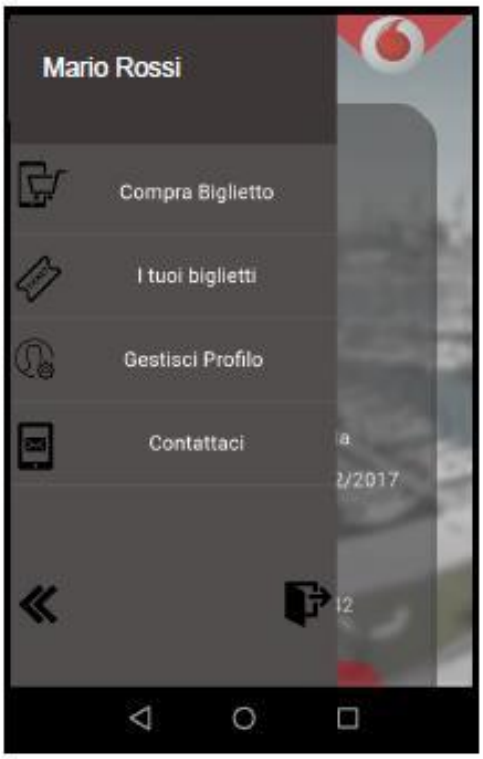
- Through the GPS form of the driver console;
- Through the physic removal of the driver console from the bus and its positioning in a specific support connected to a computer;

Applications

Online ticket purchasing app.

X-System.it has created an application for its customers in order to facilitate the online ticket purchasing.

The App has an authentication login so an user's prior registration which confers him/her a username and a password. Once the first registration has been done, every user can select the ticket through any kind of device internet connected. So it is necessary to use a credit card or a prepaid card for online payments.



Once the ticket has been paid, the user will receive a proof payment notice together with a paid ticket number. The user will show it once he/she is on-board of the chosen vehicle.

Ticket validation App.

X-System.it provides an innovative system for the on-board bus ticket validation through the QR-Code reader. Once installed, the app works on every kind of smart phone device.
It offers to the user three fundamental steps.

- Operator's Login

In order to issue the tickets on-board the operators need to be identified and certified by X-System.it through a valid login of the app. In this way it would be possible to verify the operator's identity every time by avoiding the fraudulent use of the application.

- Insert the route

After the login, the operator will insert the route in order to issue the tickets. The application will verify that the route, date and time are available. Then issue the tickets will be possible.

- Ticket Validation

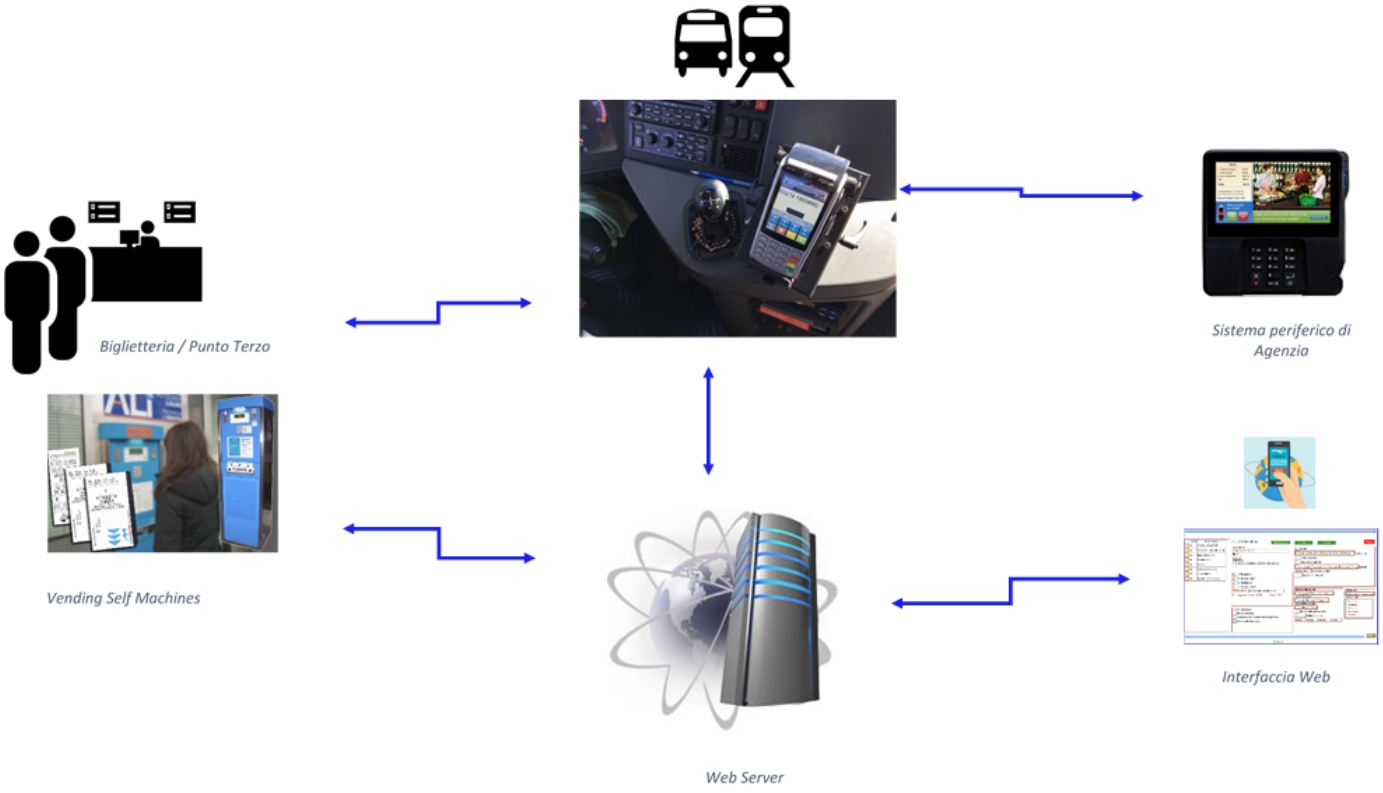
The ticket validation will be made through a smart phone device or a similar one. A video camera will scan and verify the ticket QR-Code and its expiry date on the predefined criteria:

- Existence of the ticket;
- Check if the ticket has been used previously;
- Check if the ticket is a copy of a used one;
- Check if the ticket is valid for that route (date and time included);
- More criteria if applicable.

Moreover the operator will determine if the ticket is valid for one passenger or is a multiple one.

Data Flows

The following picture summarizes and schematizes the data flows from the on-board system to the operation centre.



Updating Application

It is foreseeable that the application procedures which have been installed on-board the vehicles, could be subjected to modifications. It could happen both for the operative errors elimination or because of the updating need. The new application is sent as an on-board system file. After that the updating process will start with a specific command.

Training

The training course for the staff that is going to be responsible for the machine use will trail the company operators in the start-up phase of the supply. The offer will include a maximum of ten working days between the training course and the mentorship period. In case of necessity, it will be discussed the supply of any further training course.

Textbook

The instruction manual will be in Italian language