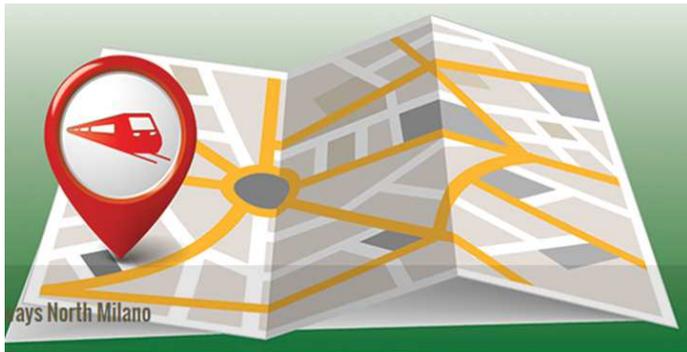# DSD Project

Qwerty Informatica was hired by a longstanding client, TreNord (a leader in local, suburban and regional rail transport), to create a system to automate the issuing of both ticket subscriptions and individual daily tickets.

This project began in December 2012 and was given the name DSD.

The DSD system features a rail ticketing terminal used both at the ticketing windows of TreNord railway stations (version DSDX) and by third-party ticket sellers such as newsstands, tobacconists and cafés (version DSDY).

Throughout the Lombardy region, there are currently some 240 DSDY installations and 31 DSDX terminals, but the latter are due to reach a total of 60 by the end of December 2014.

DSD is fully configurable in terms of both ticket prices and, for example, the profile type of cards that can be printed.

The system can manage ticket validity, number of accesses, rate compatibility and competition, whether the price needs to be printed on a physical ticket or is only available for TSC contactless smart cards, and so on.

All information is entered into a single, complete and self-consistent package known as NFP, which can be managed by way of a dedicated, parameter-based application that makes it possible to create and publish the information to all DSDs or to specific ones.
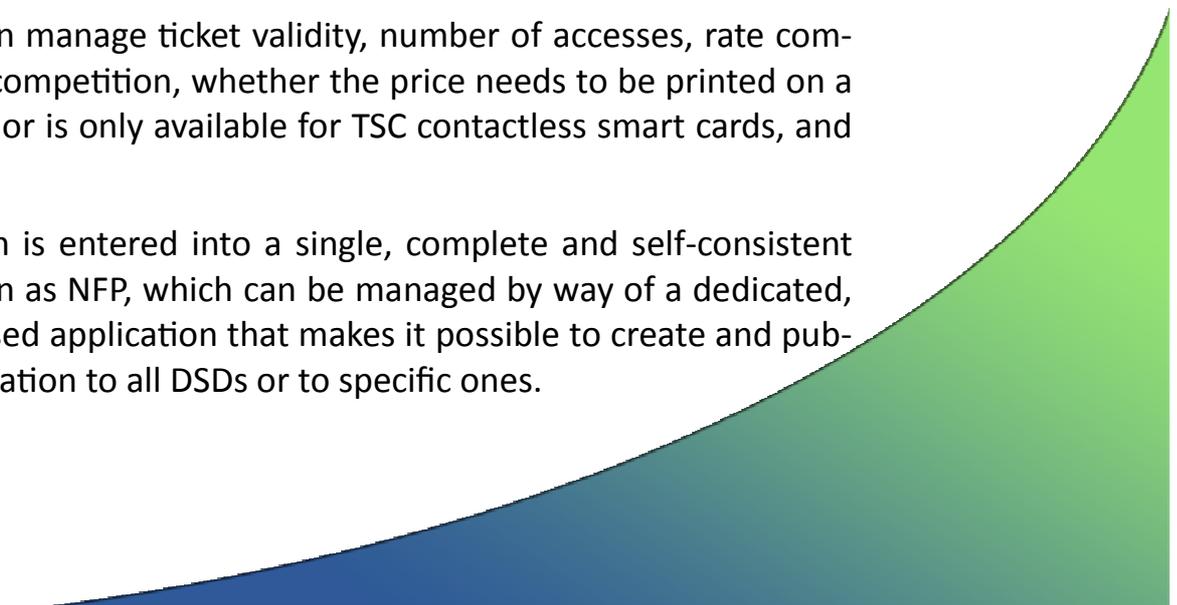
The parameters that characterize an individual terminal identify its geographic location, the type of operator concerned, or whether the system belongs to a specific area of business.

DSD can also be used to top up TSCs for contracts purchased online (WhiteList), so that TSC cardholders simply need to go to any existing terminal and touch their card to the card reader to validate the top-up.

DSD was created as an offline ticketing system and so is able to operate without a constant connection to the head office and will synchronize tickets available and tickets sold as soon as a connection with the head office is restored.
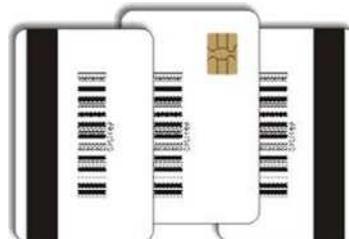
In addition to synchronization, there are various mechanisms in place to prevent a terminal from executing sales for long periods of time without connecting to the central system (so for rate changes, amounts greater that the preset figures, etc.), which is helpful in the event of disputes with DSDY operators.

The terminal is part of an existing sales network with a complex architecture in which the various nodes communicate with each other by way of both proprietary and standard protocols. In addition, the system also handles multi-network routing over a VPN for data transmission both to terminals connected via the internet and those that are connected to private networks.

DSDs are all self-updating. When not in use, the latest version of the software is downloaded and installed without any user intervention.

All DSDs connect to a central data exchange (CDX), which receives both sales data for accounting purposes and a range of services to store the NFPs, WhiteLists, new software versions, and so on.

DSD transactions are periodically transmitted to all members of the TreNord infrastructure over the various channels of communication and using the various technologies involved (real-time web service, FTP, MWP).

One of the DSD's underlying principles is that of hardware independence. In order to achieve this, the software features layers that implement the interfaces in order to decouple the hardware from the various functions involved.

The level of abstraction of the TSC within the software is such that it is independent from the physical medium, but it contains within it all of the information needed to establish the cardholder and the contracts concerned.

The topping up of a TSC can be done on any (contactless) PICC-compatible smart card (e.g. MIFARE Classic, MIFARE Plus or Calypso), but could potentially even be done by way of a contact-based interface using the ISO 7816 protocol (which is handled by the current reader). The type of reader can also be configured and, if compatible with the standard APIs, all it takes is changing the name in a specific configuration file.

The printing of the physical tickets is based on the same principle of layer independence, making it possible to use a thermal printer, an ordinary inkjet printer, or a PDF printer.

Users interact with DSD using a sturdy yet sensitive 15-inch touchscreen and a graphical interface that has been specifically designed to be quick and easy to use and features sections that propose the most frequently used tickets or allow users to save a series of their favorite tickets.

In order to ensure system reliability, the hard disks within the terminal are (Raid 1) mirrored for fault tolerance.