



All aboard with Movicon 11 at the new Forlanini Station in Milan

Cea Automazione Srl in collaboration with Ing. Roberto Di Gregorio has design engineered a lift control system for the Forlanini Station in Milan which went into operation to inaugurate the opening of the Expo.

The Forlanini Railway Station in Milan is an important and strategic node in the Milan public transport service connecting the over ground railway services with the nearby underground services. The railway station has three underground levels. There is a mezzanine level used to access the underground and the railway interchange area, a platform level for

commuters using the M4 line train service and a technological level with access restricted to personnel only. The platform level is accessed from street level by using a lift next to the local retail outlets and offices or by using stairs and ramps that are located south of the station. The FS Forlanini railway station project also provides greater accessibility for

commuters who are either disabled, have reduced mobility, visually impaired or blind. This was achieved by providing direct and obstacle-free routes between street level and the underground subway. The project is a lift system designed by CEA Automazione which is a company from Lazio in Italy with twenty years of experience and mission to offer themselves as technological partners for industrial automation systems and PLC, HMI and SCADA development software solutions. The system controls three lifts located between each railway station platform that are used by commuters with different types of disabilities.

System description

The electronic panels of the lifts have been equipped with a control unit that interfaces with an external system to notify ongoing lift operation states: floor number, door closed/opened, Alarm block, smoke detected, presence and non-presence of people in lift, and going up or down. Commands can also be activated for maintenance and emergency purposes. Decentralized peripheral devices have been installed inside the



1. Forlanini Station in Milan

electrical lift panels to collect signals from and to the lift control units. The three units are connected to each other with an Industrial Ethernet Switch to a control unit equipped with a PLC that collects the signals from the three lifts and sends commands. An industrial PC installed in the station's telecommunications and control room which communicates with the PLC by using the PROFINET and TPC/IP Ethernet protocols.

The project requirements

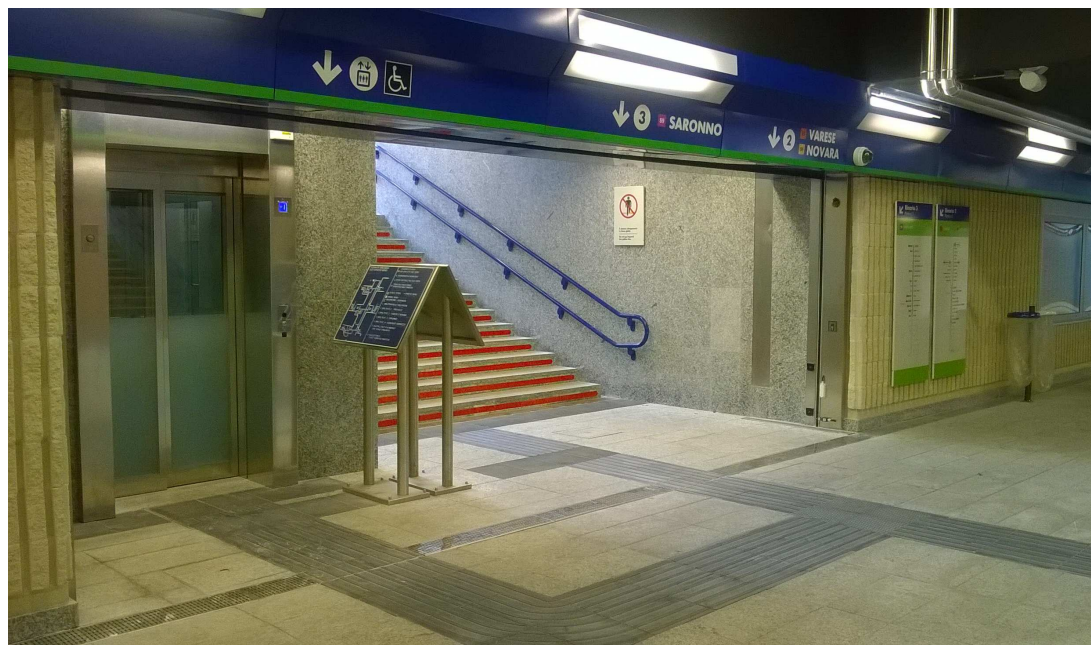
The client demands for this project were clear and precise. The software had to be capable of performing the following functions:

- System access using multi-level passwords.
- Dynamic lift status control presented in display screens with home page and various others containing menus to activate commands such as to reset and acknowledge alarms.
- Receive status conditions, alarms, malfunctions and diagnostics.
- The graphical displays documented in detail with maps of the different devices installed and symbols to represent the behaviours of each one of the three lifts.

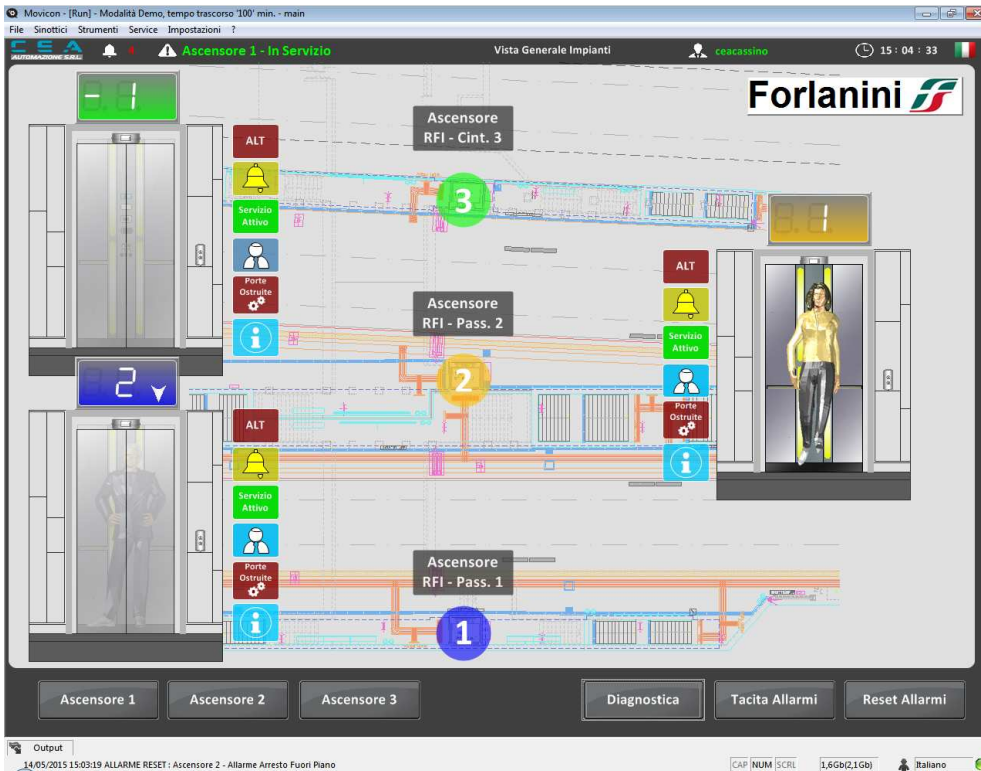
The maps had to be produced with DXF files dynamically by the Client and show the station layout complete with panels, sight glasses and control buttons for system interaction. The interface had to be created in such a way to allow the operator to activate control commands from any one of the screen pages to obtain information on the status of any micro malfunction in progress in one or more of the peripheral devices. This information had to be displayed clearly on screen for interrogation with results showing the date, hour, minute

and second of each event occurrence.

Operators had to be able to obtain information, modify statuses and reset subsystem conditions by using userfriendly menus and screens. The SCADA had to manage the variables from the installed local device meters of each lift (no. of lift movements, etc) in real-time by collecting and displaying the information on purpose-built screens for inspection and recorded on Historical Log simultaneously. The screens had to be printable on demand and show histograms. All system data had to be automatically recorded on file daily for examination or printed when needed in order to perform comparisons with previously recorded data in specific time ranges of one or more days. Furthermore the system had to record on log files, all the events that occurred in each lift device and all the operations performed by the operators, such as: login with



2. Underground station level



3. Movicon screen with graphics representing the three lifts.

password procedures, command activations and resets with the date and time they occurred. All this information had to be provided in report format on screen for the authorized operator to view and print as needed. The selectable time ranges had to be set in days, months and years. The output of this process had to be visualized in graph, histogram, diagram and pie chart format with the option to print on demand when required by the operator. The client was also wanted a user management with access levels that met the following specifications:

- Operators can only log on to the supervision and access the application by using their name, surname and password.

date, hour, minute and second or session start time.

- The compulsory password at all protection levels.
- Provide an expiry date procedure to substitute passwords at after a specific time of use in order to ensure password confidentiality.
- All access levels, names and passwords of authorized operators had to be entered and/or modified by the system administrator.
- The operators had to be provided with three access levels in order of priority corresponding to three different types of maintenance operator.

- The names of the operators and their relating password had to be recorded on a file dedicated for this purpose.
- Operator access and activities performed during their log on had to be traceable in a file dedicated for this purpose with a time stamp showing

- The levels had to be inclusive, meaning that the operator with second level access could also access at first level and the operator with third level access could have access at both first and second levels.

In addition the Supervisor system administrator had to be given the right to define the users and their logins as well as operator passwords and access levels accordingly.

Movicon was fully able to satisfy this need by already having an inbuilt security feature that ensures maximum data and data access protection. This feature protects software access by implementing a user and user password management that are easy to configure using the specific protection policies according to user level and access area.

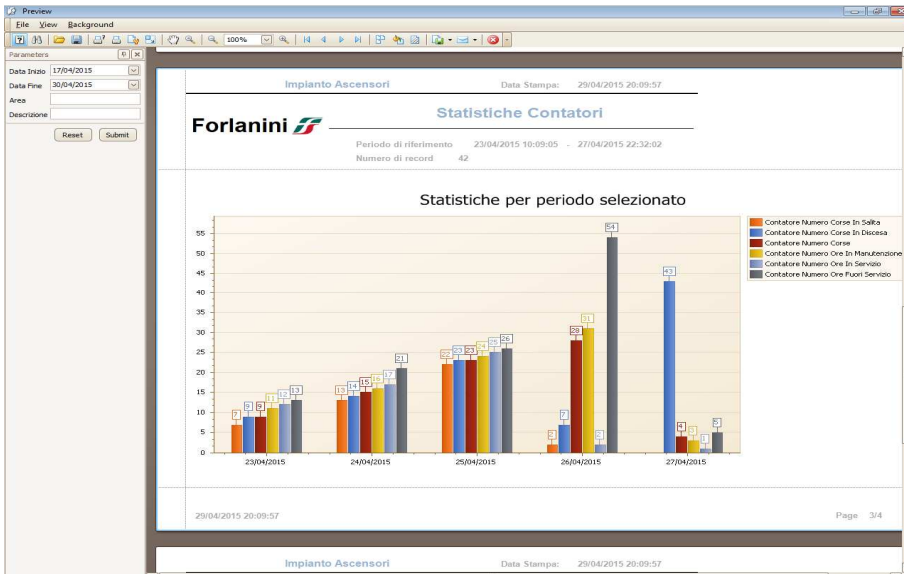
Software importance

Within its twenty years of experience, CEA Automation has used different SCADA platforms on the market according to

specific client demands. In order to satisfy these demands in the best way possible it was often necessary to use script. However the result of doing so did not always meet the expectations envisaged. In fact the results obtained were less than satisfactory and often took a long time to develop. Based on the client’s objectives that were set out in the contract specifications and the ten year know-how of the Movicon SCADA system, CEA was able to completely develop an application solution that included all the requested features. In addition they were able to deliver it before the station opened to coincide with the inauguration of the Expo in Milan on the 1st May 2015. The features which have been used



4. A detailed Movicon screen page of lift 1 showing all the settable parameters

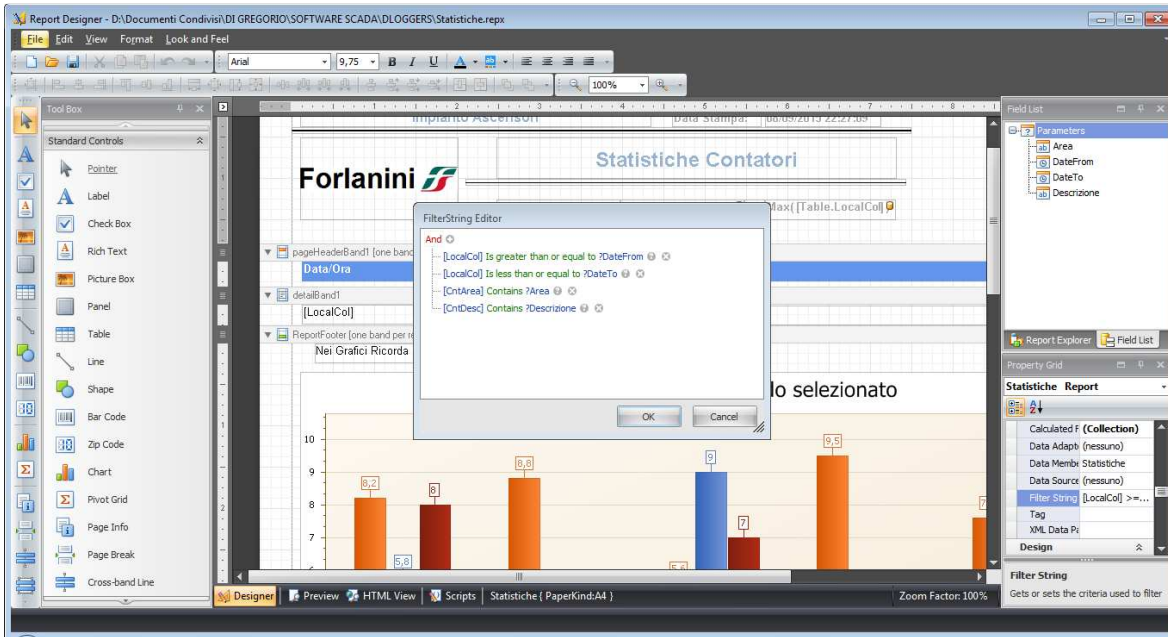


5. A Statistical Data Analysis created with the Report Designer

together with the Movicon software to make this application compliant with the customer's needs were diverse. The platform is lightweight and intuitive with XML-based project files that are quick and easy to modify externally as well. This feature is especially handy for quickly creating several graphically identical screens with each one using different variables. This is a favourable advantage that surmounts to a significant save in development times. As Movicon comes integrated with the IEC 61131-3 SoftLogic it can perform logic tasks that would otherwise be designated to the PLC. It also provides users with a complete library that contains a variety of ready-to-use symbols and objects, such as trends, schedulers and gauges, which can be simply dragged on screen and configured as needed. The diagnostics objects and databases are ready for use and come complete with integrated tools to filter data and perform reports and statistical analysis. Movicon supports all relational

databases that do not require code to be written by offering the choice of Ms SQL Server, MySQL, Oracle10 or MsAccess via ODBC in automatic. All system activities, such as PLC connection, user logins and errors are recorded on system database that can be consulted by the user. Movicon also has an integrated editor to create reports called the Report Designer. This tool helps

operators create professional and interactive reports whose contents can be exported in the most popular formats such as pdf, xls or csv for instance. The different report fields can be customized to filter specific data as required. The Filter String Editor wizard assists operators to filter data to display in the reports and thus saves the user from having to write SQL code that would otherwise be needed to perform such database queries. Furthermore C# code can be used in the Report Designer so that default values can be entered when the report is opened, such as the current day's date in the data field defined to filter data for example. This is done by using simple script which is completely compatible with the .NET languages. As also requested by the client, Movicon records each status change and controls operation performed by the operators. This is done by using an integrated Audit Trail that traces variables that have been



6. Report Designer screen with Filter String Editor feature

Movicon structure prototypes it was possible to create variables groups with member structures for each lift. Therefore the operator

enabled this function in their properties. Once this function has been enabled, data tables are automatically generated in the database to contain recorded data such as the date, time, logged in user, variable and status. In addition Movicon supports all types of graphics files such as BMP, GIF, JPG, TIF and PNG as well as WMF and EMF files. Just by performing a few operations, CEA was able to import the WMF retrieved from the CAD, to represent a main page displaying the station layout with lift locations. The properties of the images and symbols support colour transparency functions that have contributed to making the application complete with attractive visualization using graphical reproductions that are true to physical appearance of the lift system. This was greatly appreciated by the client as it mirrored the real visual aspect of the system and therefore more intuitive and simple for operators to use. By using the

need only declare a member structure in the variables for each one of the three lifts without having to write them individually. This same logic has been used to parameterize the screens. This was done by creating one detailed interface for one lift with three parameterization files to index the variables for each of the three lifts. In this way development time was reduced by two thirds as only one lift interface was needed to index variables to the other two. All the alarms, driver status and system activity is archived on relational databased automatically by Movicon. This data can then be accessed for creating reports or consulted by operators by means of using objects designed specifically for this purpose and made available to developers to configure appropriately as needed.

Conclusion

By using the integrated features of the Movicon software it was possible to satisfy the client's demands as well as those of the end system operators and users. CEA Automation Srl were able to develop an application with exceptional graphics and top notch historical logging and report features in record time.

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