DISPATCH WEB APPLICATION FOR FIELD OPERATION SUPPORT

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ABSTRACT

EDP Distribuição, as any major global utility company, finds in its Distribution Network Operation and Control, a critical strategic process in which challenges frequently arise, especially from a field perspective.
In the daily network operations the Dispatch Department works in close collaboration with the field teams, in order to execute field procedures like device switching operations, as a result of outages or planned works. This new mobility solution aims to reinforce the interaction between dispatch centers and field teams. In addition to basic navigation tools, network information and advanced functionalities such as basic sketching tools, it can be used offline, with minimum functionality loss.

INTRODUCTION

It is in both dispatch centers and field teams where information is often most needed and, at the same time, hardest to get, especially during harsh conditions or a crisis scenario.
This solution is a new initiative, mobile centric, that not only provides answers to some of the key challenges in this field of work but also leverages work processes and support tools through the use of information systems already available within the organization.
For a long time now, all network information available for field operation support was printed on partial schematic per circuit. To execute the requested tasks, the field teams depend on these MV network single-line schematic diagrams, in which the network grid and secondary substations are represented. Currently, these diagrams are updated manually, using a distinct platform of the one where all the network information is held (GIS information). They are then distributed to the teams in paper format. To manually update the diagrams, and to make them available to the teams in paper format, is not only an expensive solution but it also does not guarantee that the manually updated diagrams are always "synchronized" with the latest network information. The heavy task of having to manually update them is one of the inefficiencies that limit the evolution of this process and was the main driver for the development of this solution.
The current solution is demanding in terms of operational costs. EDP Distribuição developed a pilot initiative with the objective to overcome and improve this situation, providing easy and fast access to the schematics, always "online" regarding network updates. The solution presented in the pilot initiative was also able to accommodate additional and useful information such as geographic information aligned with the schematic, all this supported by a mobile device. This pilot initiative evolved into a project which aims to be a mobility solution for network field operations.

BASIC FEATURES

The main feature of this solution is to give access to field teams to the HV and MV network schematics that are stored in the GIS that holds all network data base. By using an image of the GIS schematics, one guarantees that the information that is provided to the teams is accurate and in synch with what the dispatch operators use. By doing so, the necessity of updating the single-line diagrams is eliminated.

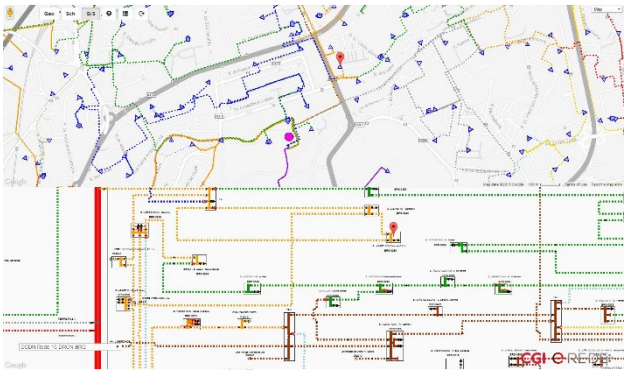

Figure 1 – Schematic and geospatial representation of MV distribution network.

In addition to this feature, the geospatial information of the network is also represented using the google maps API, allowing the usage of standard google functionalities such as address search, "my location", navigation tools or google street view.
The two visualisation modes can be displayed independently or at the same time, and network elements are linked between them, so, as we navigate to a network

element in the schematic mode, the geospatial mode will follow and vice-versa. In both modes basic network asset information can be consulted, by selecting a specific element, and the user can have access to the installation's internal scheme.

Figure 2 – Access to secondary substation basic information and internal scheme and street view window.

Although the driver for this project was the access to HV and MV network information in the field, we have also included the LV network. In this way we overcome one of the major shortcomings of the process: access to LV network information in the field.
Despite the fact that one can access this application on a standard PC, as this is a mobility solution to be used mainly by field teams, its development targeted the use of mobile devices.

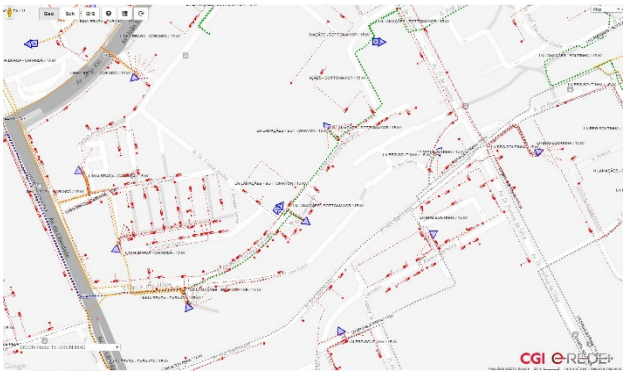

Figure 3 – LV network geospatial representation

Offline feature

As field teams depend on GPRS communications provided by telecommunication operators, the connectivity between the mobile device and the application server is not entirely assured, especially in remote locations and in outage situations. Thus, it was specified that this solution can be used in offline mode, ensuring the main features and with minimum functionalities loss.

ADVANCED FUNCTIONALITIES

In addition to the basic features, some advanced functionalities were incorporated into this solution. These were design to tackle some specificities of a DSO business.

Feeder highlight

The previous solution was based on network single-line schematic diagrams. With this new application the field teams have access to the entire network schematic. This feature can bring some constraints as it can become difficult to focus on one specific feeder or part of the network due to the volume of data displayed. To overcome this constraint, it is possible to highlight one specific feeder in order to facilitate the focus on the relevant part of the network for a specific situation.

Access to real time network configuration

HV and MV network schematics reflect the normal operational configuration (NOC) of the network. However, the network configuration changes during time as a result of operational needs such programmed interventions or an unexpected outage. It is important that field teams have access to the current operational configuration (COC) of the network. The COC is reflected by marking on the geospatial and schematic views every switching equipment that is not in its normal state (normally open or normally closed). The switching operations are directly obtained from the OMS system, therefore making this functionality unavailable in offline mode.

Figure 4 – Indication of switching operations

Information gathering and dissemination

Field teams frequently have the need to collect information from the field, usually by using photos. These photos are used to better report damage or as evidence to prove a third party responsibility in an outage. This solution allows them to easily take photos with GPS location and timestamp information embedded

and then attach them to a form that contains additional information such as outage identification and damaged equipment.
This information, form and photo, can then be uploaded to the server, where it will be linked to the equipment in question and become available to everyone who is interested, and /or can be e-mailed to a specific group of people.
Furthermore, this functionality allows the direct integration of the information collected in the field and existing business processes, such as compensation claims, avoiding manual procedures and information misplacement.

Figure 5 – MV overhead line damaged support photo

Basic sketching tools

In order to record further information from the field, this application provides basic sketching tools. This functionality allows the field teams to insert notes directly on the photo or emphasize small details like a specific damaged insulator of an isolator string or the damaged supports of an overhead line.
This additional information is very useful in identifying problems and brings significant operational improvement to the process.

Figure 6 – Geospatial position of a damaged MV overhead line support with additional notes

NEXT STEPS

It is expected that this solution will continue to evolve as a mobility solution that reinforces the interaction between dispatch operators and field teams. The integration of this application with other systems used to operate the distribution network is also part of its roadmap. This solution can be a privileged channel for obtaining information from the field. In addition to information related to equipment damage or network outages, one can easily report the installation of a mobile generator or his geographic position using this application for example. This information can then be used by other applications, like an outage analysis software that can use mobile generators location and the team's position to better sequence restoration switching operations.
Augmented reality (AR) functionalities can also be added. The field team will be able to grant the dispatch operator remote access to the tablet's camera to enable a better assessment of the situation on the field or access 3D substation internal schemes.

CONCLUSION

This solution aims to replace current single-line schematics used by field teams, therefore eliminating some of the constraints and problems associated with its use:

- More accurate and synchronized network data
- Improved and more reliable interactions between dispatch operators and field teams
- Significant reduction of operational costs
- Easy and fast access to information

and adding new features and functionalities:

- Geospatial network representation
- LV network representation
- Standard google functionalities such as address search, "my location", navigation tools or google street view
- Access to equipment information and installation's internal scheme

- Feeder highlight
- Real time network configuration
- Information gathering and its dissemination
- Basic sketching tools

A pilot initiative was developed to confirm the solution's added value and, due to its success, it evolved to a project.
This application aims to be a mobility solution for field operations, so its specification and development took into account the field performance and usability. As such the absence of connectivity (GPRS) poses no problem as it can be used in offline mode with minimum functionality loss.
One of the objectives of this solution is for it to be a useful interaction tool between dispatch operators and field teams but it is also expected that it will be a privileged channel for obtaining information from the field. This includes not only information related to equipment damage or network outages, but also relevant operational information.