FLEXe

Future Energy System

Situational awareness solutions for major disturbance management

Society is increasingly dependent on electricity and telecommunications. Managing situational awareness externally and internally enables a fast recovery from the disturbance.

Development of situation awareness solutions

There is basically two types of situation awareness solutions from distribution system operator (DSO) point of view – internal and external. Internal means situation awareness needed by DSO repair organizations supporting it and external means situation awareness required by rescue services and municipalities. As part of FLEXe project Elenia (Finnish DSO) has developed internal situation awareness map with Futurice and together with FMI studied thunder storm correlation to network fault information.

Outage coordination map for internal situational awareness

Map can be used in case of wide network outages to get good internal situational picture of most problematic areas and coordinate resource management at the control center. All this data is usually available, but it is difficult to obtain, since it is scattered around multiple systems and sometimes available only on database level. Seeing the overall picture is impossible.

During the project Elenia identified relevant key figures and a single API was created to extract the data from various different databases and aggregate the data to a new single page app.

Basic view of the tool is large map showing all operational areas of Elenia (fig. 1) with key figures listed on the left side of the screen.

Map automatically calculates situation criticality level based on number and type of network faults and number of fault information received form customer per operation area in relation to all other areas, making the map highlight most problematic areas in all kinds of outage cases.

Real time power outage data is generated by Trimble DMS and passed on to a scalable interactive map platform. Solution could be easily extended to show more operational figures, real time resource tracking via GPS, weather data etc.

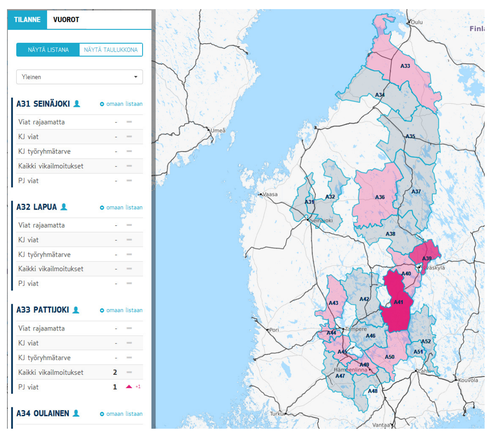

Fig. 1

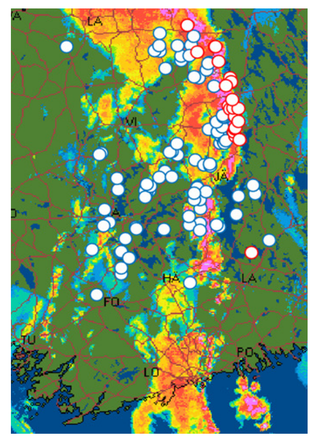

Fig. 2

Thunder storms and electrical networks – combining fault data and weather measurements

Forecasting thunderstorms is a difficult task because it's a very local and rapidly developing phenomenon. Effects to electrical networks can be severe and more accurate forecasting would improve preparation for fault situation.

In this study meteorological information (weather radar observations) were combined with network fault locations to see how the severity of the thunderstorm could be automatically analyzed.

In fig. 2 is an example of weather radar echoes and network faults in Elenia's distribution area during storm Helena 2014. Red dots are very recent network faults and blue dots network faults observed 10 minutes or more ago.

As can be seen network faults follow the course of the thunderstorm and in analyzed fault cases there were almost always high values of radar reflectivity and heavy lightning. With extensive fault location data and network location data some probabilities for network faults could be calculated in the future.