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Innovation Action



flexitranstore

An Integrated Platform for Increased FLEXibility in smart TRANSMission grids with STORAge Entities and large penetration of Renewable Energy Sources



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D9.2 Specification of IT system integration

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Executive summary

1.1 Scope of deliverable

Work package 9 of FLEXITRANSTORE will demonstrate how to enable flexibility in the wholesale market as well as the operation of the elaborated market design and clearing algorithm that is harmonized with the requirements of the Internal Electricity Market. In the frame of the work package, the intra-day market structure is tailored for flexibility providers (DSM sources and storage owners) through the introduction of new flexibility products.

During the demonstration, the market demonstration application will run in parallel to the Bulgarian and Cypriot markets, thus it has to be connected to the already existing processes of relevant entities in both countries (TSOs, market operators, etc.). Data streams, and required interfaces need to be specified in order to allow integration of the new developments.

Deliverable D9.2 presents preliminary information on IT integration, taking into consideration existing processes and infrastructure in demonstration markets, data streams defined in Deliverable D9.1. and the present state of architecture of the FEG platform.

1.2 Concept and methodology

As a provider for its Day-ahead (DAM) and Intraday (IDM) markets trading systems IBEX is using the services of Nord Pool AS. The IT infrastructure and workflow between IBEX members, IBEX and Nord Pool are as follows:

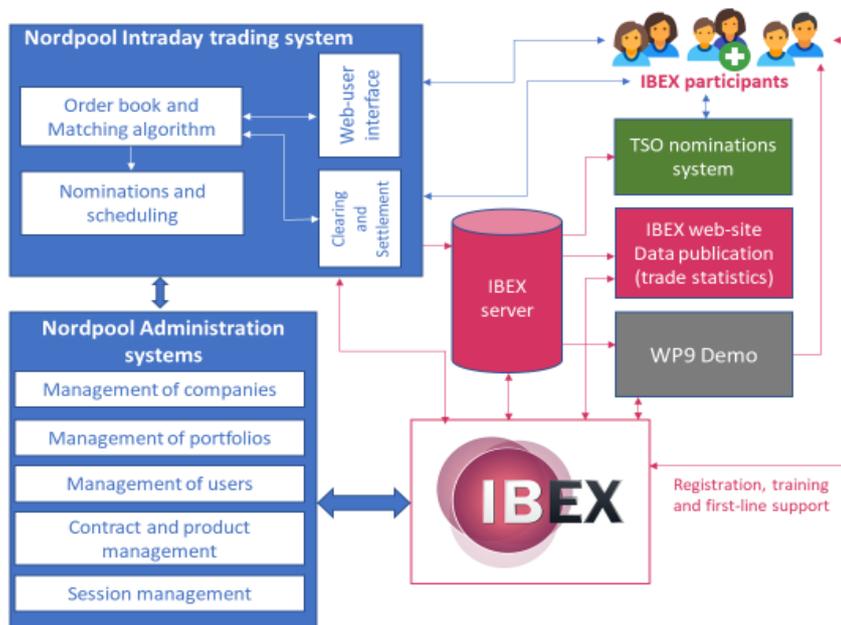


Figure 1 IT Infrastructure scheme

The demo will run a fictive market (in Bulgaria and Cyprus) parallel with the currently operating real one. The market players can participate in the demo according to their own parameters. Similarly, the system operators (TSOs, DSOs) demand specific flexibility that is required for their

network control activity. The algorithm will optimize for the welfare maximum, while the result will provide cost reduction for market players. Each participant in the fictive market, collects experiences to reach their optimum bidding strategy. The demonstration will be one year long and will be divided into sections according to the initial planned scenarios. The only issues that this demonstrator has to deal with are data and data sources that can be used for testing purposes. Therefore, real data (measurements and forecasts) will be used but with one-week delay. The certain component (AOS) of the platform will be built upon a database that contains the data from the previous week. The available data should be one-week-lag market data and forecasted weather information.

1.3 Key activities

Enhanced Market Demo Software designed for operating a parallel run experimental (but improved) market with the existing one with the following modules:

- Order book manager (OBM): Handles and manages the orders of voluntary bidders and the orders converted from the bids of the real market. The OBM runs the matching algorithm after every new bid and processes the results immediately.
- Automated Order Source (AOS) consists of two components and main functionalities: – application in MATLAB or other platform.
 - Order converter: Includes function to convert the bids offered to the real market (or to generate bids from historical ones) into the form of bids necessary for improved market.
 - Order Generator: Includes function to generate bids for the studied scenarios
- Market clearing tool: Consists of a mathematical module to calculate the clearing results (price, volume, order acceptance, etc.) – based on C executable.
- Developer and analyzer of modules: Is responsible for tuning the model during the demo because a continuous supervision on the software is needed (this is necessary to speed up the calculation process by tuning the parameters). Application will be hosted in MATLAB or other platform.
- Web interface: Continuously provides updated screen on all visible orders and provides instant feedback to the participant in case of order execution.

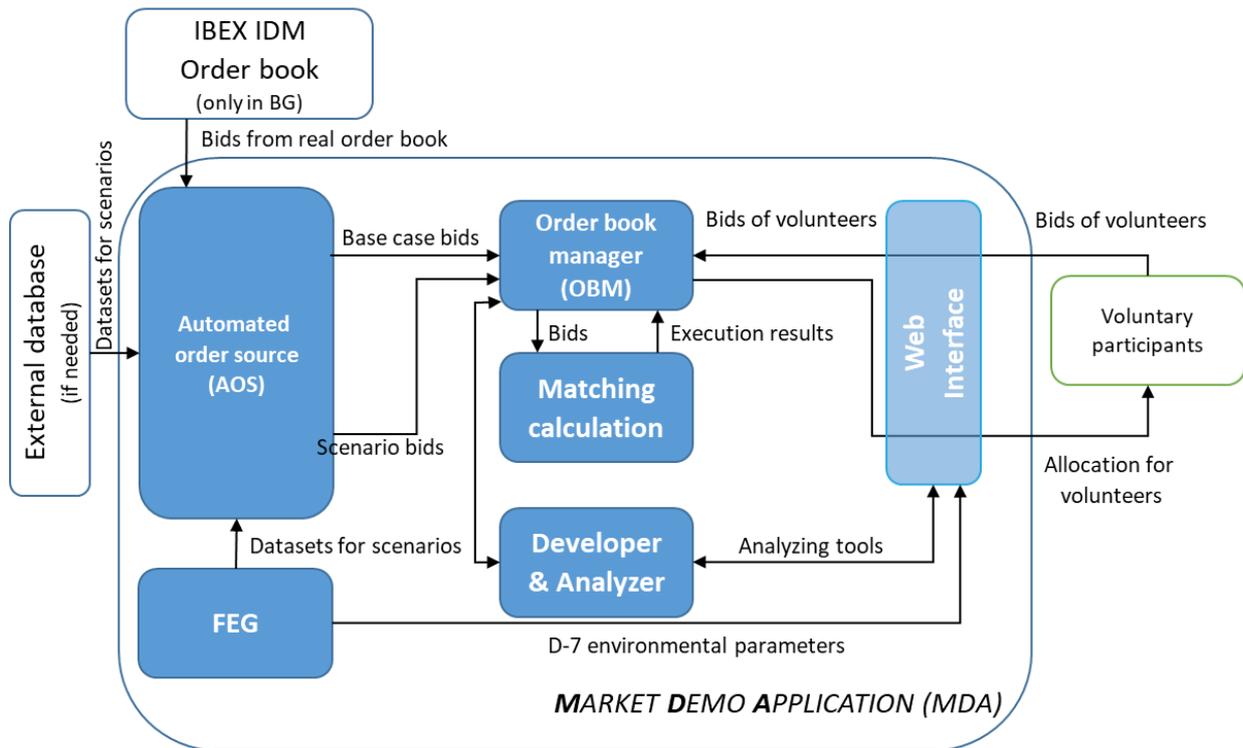


Figure 0- Concept overview of Enhanced Market Demo Application

Market Software Demo support services are:

- Answering flexibility inquiries
- Managing different order types for flexibility services
- Flexibility bids management
- Adjusting bidding strategy to weather forecast
- Improving bidding strategy with different order palette
- Try out bidding strategy during extreme/unexpected weather events

Provider of datasets:

- INTRA: FEG database – Market Demonstrator Database(MDD),
- Internal modules: AOS, web interface, OBM, matching algorithm, analyzer
- INTER: market participants, TSOs, weather services, market operators.

Content of datasets are as follow:

- orders from voluntary participants (.csv or .xml)
- real orders of existing markets (file formats depend on the NordPool software, probably .csv)
- The form of datasets inside the demo application and exchanged between the modules is not determined yet, probably self-defined, text based file-type or csv.
- D-1 and H-2 weather forecast (required by AOS and Web interface)

- Data about power system (may be required by AOS, specified later)

1.4 Key results/Main findings

Market Demo Application (MDA) should be fully integrated within the FEG platform and in such way it will provide one of the many components or tools of the FEG toolbox portfolio. FEG platform should provide to MDA connectivity to the main database (as previously shown in the Figure 3) where all data for AOS will be stored. For the Bulgarian demo, this data content is specified by TUS (e.g. DAM and BAM prices, Bulgarian weather info such as temperature, cloudiness, etc.). Also, base case bids need to be converted from the real market order book of IBEX (and these data will be of 7-day delay and stored into a dedicated database). For Cyprus demo, data content is specified by UCY (e.g. DAM and BAM prices, Cypriot weather info, etc.). Here, also in the absence of Cypriot intraday market base case bids need to be generated.

The Market Software Demo Tool - developed for the purposes of WP9 - will be integrated into the FEG Platform and allow System Operators to run market simulations. The diagram below illustrates how the tool is used in both Demo and Production modes.

In Production mode (commercial product after the project), the Market Software Demo Tool is expected to use data retrieved during the Demo execution as its main source. That data will be forwarded to the AOS Process through a Database Connector, and the output of that process sent to the MDA Process. The MDA Process will then process bids and store information back into the MDD.

The Market Software Demo Tool will also allow the operator to provide manually weather/market data, and this could be done by connecting to a local database, reading a local file, or consuming a local web service. In any of these cases, the local information will be sent to the AOS Process, and from then the flow will continue as described above.

During the demo, the Market Software Demo Tool will receive information by a FEG Local instance that will be installed within BME infrastructure. The Local instance will connect to FEG Central and send its data which will be encrypted and only able to be decrypted by the target FEG Local operator.

It is important to emphasize that receiving market/weather information from an external partner is possible even in Production mode, even though not currently envisioned.

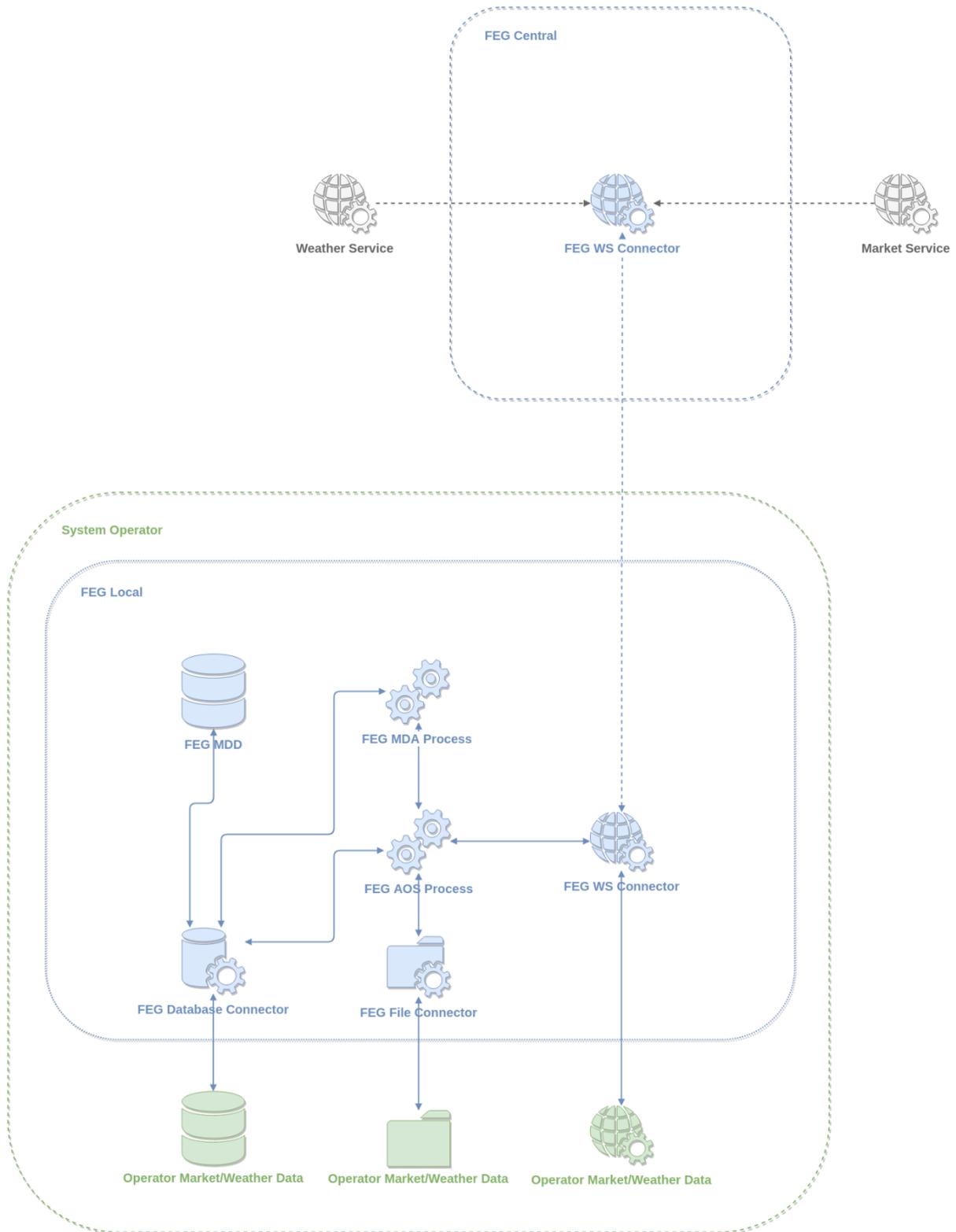


Figure 2 WP9 - The Market Software Demo Tool

1.5 Conclusions

The studies of the FLEXITRANSTORE consortium within WP9 are following the evolution of the electricity markets in Bulgaria and Cyprus and will improve the flexibility studies platform being developed in WP2 for flexibility indices assessment and strategic decision making method for innovation integration.

A very important milestone for WP9 is the Enhanced Market Demo Software designed for operating a parallel run experimental (but improved) market with the existing one with new modules. As showcased in the deliverable the IT system integration will be crucial and the timely and accurate transfer of data from different sources is the key to the successful run of the Demo phase of the project.