TRANSNATIONAL ACCESS
USER PROJECT FACT SHEET

USER PROJECT	
Acronym	**iReact-NG**
Title	**iReactive-New Generation**
ERIGrid Reference	**04.026.2018**
TA Call No.	**654113**

HOST RESEARCH INFRASTRUCTURE			
Name	**Austrian Institute of Technology (AIT)**		
Country	**Austria**		
Start date	**24 Feb 2020**	**Nº of Access days**	**9**
End date	**7 Mar 2020**	**Nº of Stay days**	**13**

USER GROUP	
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1. USER PROJECT SUMMARY (objectives, set-up, methodology, approach, motivation)

In the last few decades, the transition from using fossil fuels to renewable energy generation has started to impose certain challenges on grid operators (voltage and overload impact, grid reliability, high energy generation costs in isolated grids etc.). Thus, grid operators need a new generation of digital management systems that demonstrate convergence of technologies, interoperability and real-time reliable services orchestration that will eventually lead to true AI operations.

The iReact-NG project incorporates several elements with aim to tackle these challenges by combining different disciplines and technologies as well as software and hardware elements into a unified solution for Distributed Energy Resources (DER) Management Systems. The goal is to provide grid operators with the optimum operation scenario under the presence of renewable sources, storage, electric vehicles, etc. This will be achieved with accurate forecasting of the grid status and real-time scheduling of the distributed generation.

This solution has been in continuous development almost since the foundation of EMTECH and it has gone through several iterations producing a remarkable line of products, many of which are used in the field in over 150 installations. And even though the initial goal started from a simple individual need, within the last decade we managed to expand it well beyond our initial vision and to enrich it with more and more sophisticated features.

And now, the solution has reached a point where interoperability constitutes an essential element, among others combined, to significantly increase the quality of our solution. Thus, the main objective of this task, accomplished within the context of the ERIGrid project in cooperation with the Austrian Institute of Technology (AIT), was the validation of the interoperability of one of our smart sensor devices using a commercial SCADA system and to receive the appropriate support and an initial training on certain standards (IEC-61850, IEC-60870, DNP3, and other) to decide which one is the most suitable to integrate into our solution.

The smart sensor device that was used is the iReact-EXT-1, it is a microcontroller-based smart sensor, providing appropriate interfaces to enable measurements of the primary high-voltage of the substation's transformer as well as other measurements. In addition, the device supports the MODBUS TCP protocol for handling requests from other devices and remote terminals.

Our approach was to arrange a simple setup consisting of the device itself and the Zenon SCADA. The idea was that an appropriate AC signal representing the voltage of the transformer would be fed to the sensor, which will measure continuously, and when the measurement is requested from the SCADA it would be displayed. The input signal was arranged to be configurable, thus, when running the session, the displayed measurement value changes accordingly whenever the input signal is adjusted.

Figure 1 depicts the arrangement of the setup described above showing the elements utilized. The formation of the input AC signal was achieved using a Typhoon HiL device. A project was created in the virtual HiL software provided to arrange the required components and to configure the appropriate inputs/outputs and interfaces. Though, it was pointed out that such a sophisticated equipment is designed to be utilized mainly for complex simulations, however, our motivation was to get acquainted with many different commercial products by doing a simple demonstration.

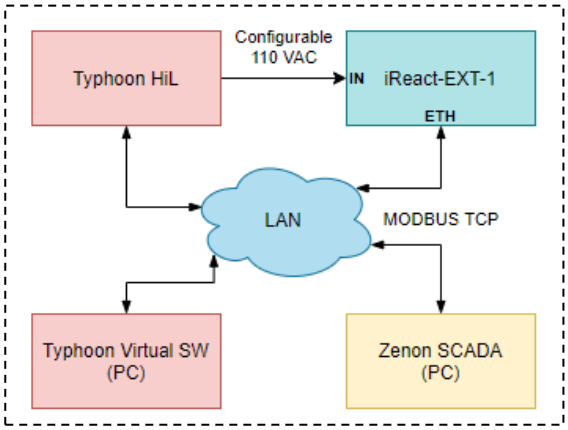

Figure 1: Verification arrangement setup

2. MAIN ACHIEVEMENTS (results, conclusions, lessons learned)

Main achievement was to verify the interoperability between the device and the commercial SCADA using the MODBUS TCP as a communication protocol. One feature that was proven difficult was the complexity of the configuration interface of the SCADA, it took more time than anticipated to select the appropriate driver for the MODBUS. Also, some minor modifications were applied to the external interface board connected to the Typhoon HiL that were necessary to operate properly.

As part of the main objectives of this project was to obtain the appropriate expertise as a starting point regarding the IEC-61850, which was achieved through a series of presentations, documentation, discussions, and a demonstration using the ABB SACE Emax2 circuit breaker along with an open-source tool (IEDExplorer) to obtain the data tree from the device. Though, part of the demonstration was to remote-control the ABB device, but it was realized that an additional module was required to remotely control the device using IEC-61850. Therefore, the demonstration was limited to triggering the device manually on the spot and remotely obtaining the corresponding status variable. The Zenon SCADA was also used to perform the same demonstration as a second option.

Additional information was obtained through presentations by the head of the Electric Energy department and the Power Electronics department. Also, photo material was acquired while visiting AIT's laboratories and energy department facilities demonstrating the state-of-the-art infrastructure comprised of different special devices and sophisticated equipment and power systems covering a wide range of applications. Moreover, all presentations and important documentation were provided including a list of suggested reading material, scientific papers, a PhD thesis on Model-driven engineering for smart grid automation, another PhD thesis on Adaptable engineering support framework for multi-functional battery energy storage systems, and a list of useful links and tools addressed and used during this activity.

Further discussion was exchanged regarding a possible future collaboration between AIT and EMTECH regarding the Space sector, where EMTECH exhibits years of experience gained from collaborations with major organizations and companies involved in the Space domain.

The next foreseeable steps involve moving aggressively towards the IEC-61850 protocol integration into our line of products. In addition, participation in the second round of the ERIGrid project is a possible action.

3. PLANNED DISSEMINATION OF RESULTS (journals, conferences, others)

No particular dissemination of any kind is foreseen as output of this project. However, a press release shall be published by EMTECH summarizing the essence of this collaboration regarding the activity that took place and what was gained from it.

4. PLANNED DISSEMINATION OF RESULTS THROUGH ERIGRID CHANNELS

Contact erigrid-ta@list.ait.ac.at to organise promotion of your results

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