Enabling IEC 61850 Communication for Power Meters using SYNC 200

Background
Customer: CCK
Region: South America
Industry: Transmission & Distribution

Solutions
• SYNC 200 IED Protocol Module

Challenge
CCK wanted to enable their existing power meter products with the IEC 61850 protocol to extend their market reach and product life.

Business Need
CCK, a major power meter manufacturer for Brazil and MERCOSUR markets with experience in numerous large-scale deployments spread over two decades. Founded in 1991, CCK has expanded and offers a wide range of industrial meters including power quality meters, as well as numerous energy management software and tools. CCK tapped the burgeoning segment around IEC 61850 enabled devices and incorporated IEC 61850 protocol in their power meters.

The decision was to integrate IEC 61850 into the existing metering product. This was to be implemented at minimal development costs and more importantly, in a very short time-frame for faster go-to-market.

CCK’s customers in Latin American countries were undertaking large-scale substation automation projects. The majority of the multi-billion-dollar projects planned to use the IEC 61850 protocol for their backbone as it was field proven and offered faster communications. In addition, IEC 61850 ensured interoperability and greater flexibility to utilize IEDs and primary equipment from multiple vendors while meeting performance and cost goals. As a local company, CCK had an inherent advantage with lower taxation rates and therefore was well positioned to provide a cost effective solution for the substation modernization projects.
Kalkitech offered CCK several options for integrating IEC 61850 into their power meters:

- Source Code
- Embedded Board
- External Gateway

Each alternative was evaluated: While source code is a common route for IEC 61850 integration, this path had some disadvantages. Specifically, capital and R&D costs were higher and time-to-market would take longer.

An external gateway was deemed not to be a viable solution based on cost. The proposed solution was to integrate and install the SYNC 200 (IED Protocol Module), that converts the native Modbus protocol in the device to IEC 61850.

The SYNC 200 is a module that is easily integrated into the meters embedded and provides CCK with the flexibility and time-to-market advantage needed to showcase their product to meet the proof of concept timelines to the system integrator and utilities. Additional advantages of an embedded board level implementation compared to in-house protocol implementation include:

<table>
<thead>
<tr>
<th>Embedded Board Approach</th>
<th>Protocol Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites – No technical prerequisites. However, it had constraints on the mechanical front and present device accommodated SYNC 200 module and add-on board for interfacing.</td>
<td>No change in hardware required. The software implementation required high end memory and performance of the processor used in the device.</td>
</tr>
<tr>
<td>Designed for adding protocol support to the CCK meters without impacting performance of the meters</td>
<td>Based on cost, integration of the protocol stack made sense for a new product rather than upgrade of a legacy product</td>
</tr>
<tr>
<td>Easy addition of new protocols and updates of existing protocols, without any hardware change and implementation effort from customer end</td>
<td>Implementation process repeated for each protocol and updates</td>
</tr>
<tr>
<td>No recertification cost involved as the enhancement was internal</td>
<td>New products typically require the additional time and costs associated with various certifications</td>
</tr>
<tr>
<td>Faster Implementation (less than 1 month)</td>
<td>Minimum 3-4 months for implementation</td>
</tr>
<tr>
<td>Less resources needed for implementation</td>
<td>More effort and resources involved including new complete hardware &amp; software design and product certification</td>
</tr>
</tbody>
</table>

SYNC 241 was selected by the CCK engineers for the integration of IEC 61850 in the power meter. The SYNC 241 met the performance requirements plus offered the option of scalability with a pluggable Ethernet port. This was plugged internally to the device connecting the TTL interface of the device and the Ethernet port was removed from the device. The complete integration process, including a minor board design and testing, was completed in two weeks.

To facilitate development, Kalkitech provided the SYNC 200 Developer Kit which includes a Development Board, SYNC 200 modules, design documentation and a support package of 20 hours. The SYNC 200 Developer Kit helped CCK get acquainted with the various features of the module and also included support which helped in the integration and accelerated project completion.

Kalkitech also assisted CCK in the customization of the EasyConnect configuration tool provided along with the SYNC 200. With the customization, EasyConnect is consistent with CCK’s software and offers translation to its native languages. EasyConnect also features quick turnaround time in the configuration of the ICD (IED Capability Description File).

The Kalkitech SYNC 200 module offers the following features:
- CCK devices supported IEC 61850, DNP3.0, IEC 104 and DLMS protocols with addition of SYNC 200 module
- CCK devices were preconfigured to have preloaded model specific ICD and supported high end features like reports and GOOSE. The devices had only master-slave poll based scheme for sending data prior to the upgrade
- CCK devices supported connectivity to external multiple masters through any of the supported protocols
- CCK devices became an Ethernet network and supported all functionality like remote configuration, diagnostics and file transfer
- CCK devices supported IEC 62351 based security for TCP/IP profiles for IEC 104 and DNP3.0

**Results**

CCK developed an enhanced power meter with IEC 61850 in a month and successfully conducted proof of concept with major system integrators, enabling them to win significant orders. Certification and other services provided by Kalkitech enabled CCK to increase its market scope beyond Brazil and expand its presence to Europe and Asia markets.

![SYNC Module and Interface card](image)

**Fig 1: SYNC Module and Interface card**
Future enhancements planned on CCK main board:

- Time Synchronization from OEM to CCK board—CCK boards had only Modbus protocol which did not have standard mechanism for time synchronization. To make time synchronization between OEM board and CCK device, customization on Modbus was required.
- Event timestamp originated from CCK board—Event timestamp was generated from OEM board based on the data reporting time. Custom event queue was implemented on Modbus side to exchange all the event information including timestamp.