

Multiprotocol Communication Software for Power Electronic Meters

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Resumo: A evolução da microeletrônica permitiu que os medidores eletrônicos de energia pudessem se comunicar com outros equipamentos. Essa comunicação possibilitou que as grandezas desses equipamentos pudessem ser lidas ou alteradas em campo, ou em uma fase de validação dentro da concessionária. Pela necessidade crescente das concessionárias por um software de comunicação que atenda a uma variedade maior de medidores, foi desenvolvido o Olimpo, um software de comunicação multiprotocolo para medidores eletrônicos que se comunicam utilizando os padrões ABNT e DLMS. Esse software possui uma arquitetura modular e escalável com possibilidade de inclusão de novos medidores com poucas alterações de configuração.

Palavras-chave: Comunicação com medidores de energia; Smartmetering; plataforma multiprotocolo.

Abstract: The evolution of microelectronics allowed the power electronic meters to communicate with other equipment. This communication allowed the magnitudes of the equipment to be read or changed at the field, or in a validation stage within the utility company. Due to the increasing need of the utility companies for communication software that serves a greater variety of meters, Olimpo has been developed, which is a multiprotocol communication software for the electronic meters that communicates using the ABNT and DLMS standards. This software has a modular and scalable architecture with the possibility of adding new meters with few settings.

Keywords: Communication with the power meters; Smart metering; Multiprotocol platform.

1. INTRODUCTION

Currently, the power electronic meters have microprocessors that allow their communication with other equipment. This communication can be wired or wireless, and can be performed via some important communication protocols, such as Associação Brasileira de Normas Técnicas ABNT (NBR 14522) [1] and device language message specification (DLMS) [2]. A power electronic meter industry should market their products and allow them to be tested by the customers. With the advent of the smart metering [3-5], power meters can communicate with other equipment via serial or wireless communication, and this fact allows the meters to be configured or their magnitudes read at the field. Thus, a communication software for these meters becomes essential, both for the consumer to test the purchased equipment, and for the consumer to configure the meters and read their measurements at the field. For this reason, Olimpo software, a multiprotocol communication software for the power electronic meters, was developed.

Olimpo software was developed to enable communication with a variety of meters marketed by Eletra Energy Solutions. In a single running environment, different meters can be configured or read with the features present in the software. Another important advantage of this software related to others found in the market is the ease of adding new types of meters to the software portfolio. Thus, summarizing the contributions of this study, we can relate: i) a multiprotocol communication software that will allow the customer to communicate with their meters at the field or in the testing department; ii) a communication software that facilitates the addition of new types of meters with few settings; iii) communication software that allows

you to communicate with the ABNT and DLMS meters in the same running environment.

The rest of the paper is organized as follows. In Section 2, the materials and methods are presented in detail. Section 3 describes the results. Finally, Section 4 concludes the paper.

2. MATERIALS AND METHODS

2.1. Components and development environment

Olimpo software was developed in Java language for greater portability on different platforms. Java frameworks were used to perform activities such as: data collection, string manipulation, regression tests, PDF generators, among others. These activities are important for Olimpo to present all the communication features with the electronic meters. These frameworks are: 'velocity 1.7', 'commons-collections 3.2.1', 'commons-lang 2.4', 'junit 4.12', 'hamcrest 1.3', 'itext 5.5.9', 'poi 3.13', 'log4j 1.2.17', 'jssc 2.8'. Eclipse is the IDE that has been used to develop all the Java methods and classes for Olimpo.

2.2. Methods

Olimpo is a software that performs several activities on the power electronic meter, such as: reading of electrical quantities and parameters, changing of parameters, operational program load, reading of user output, data analysis, among others. These functionalities can be performed on both THS (ABNT) and DLMS power meters.

Olimpo architecture is flexible and scalable, because it allows communication with the power meters using the ABNT or DLMS protocols, besides allowing the addition of new types of meters with few settings. New types of meters are included by the strategy called 'load schema', which loads a XML schema of the meter to be included (and communicated) in the software.

With this strategy, few setting is required to perform the addition of new meter in the software.

Olimpo software has a middleware that consists of the Java methods and classes, called MCI (Meter Communication Interface). MCI has a main class called 'MeterComm', which establishes communication between the Olimpo software visualization class and the electronic meter. In Figure1, a diagram with the 'MeterComm' methods is presented. This Java class is represented by the following methods: *'loadSchema()' method*–it prepares the 'MeterComm' object to interact with the meter described in the provided schematic. This method must be invoked before other methods, and it has,as parameter, the XML schema to be loaded. *'getAvailableCommands()' method* - it returns a command map from the supplied XML schema when it loads. If this schema is not loaded, an empty command map is returned. *'getAvailableComPorts()' method* - it returns a list of serialcommportsavailable on the computer running the Olimpo software. *'connect()' method*- it opens the connection to the meter. Read and write operations on the meter are only possible after the connection has been opened by the 'connect()' method. The parameters passed to this method are:'portName' and 'type', which represent the name of the commport to be connected, and the type of connection, respectively. *'readCommand()' method* – it allows the reading of a command, and updating its internal values. This method has as passed parameter 'cmd', which refers to the command to be read. *'writeCommand()' method*–it allows to write a command, and updating its internal values. This method has as passed parameter 'cmd', which referstothecommand to be write. *'reloadCommand()' method* - it allows to load the firmware via the ABNT mode. In ABNT mode, this method initially writes a command '53', and, for each block of firmware to be loaded,it writes a command '54'. Finally,

command '55' is wrote to finish the operational program loading. This method has as passed parameter the path to the extended file '.01'. *'disconnect()' method* - itallows the connection with the meter to be finished.

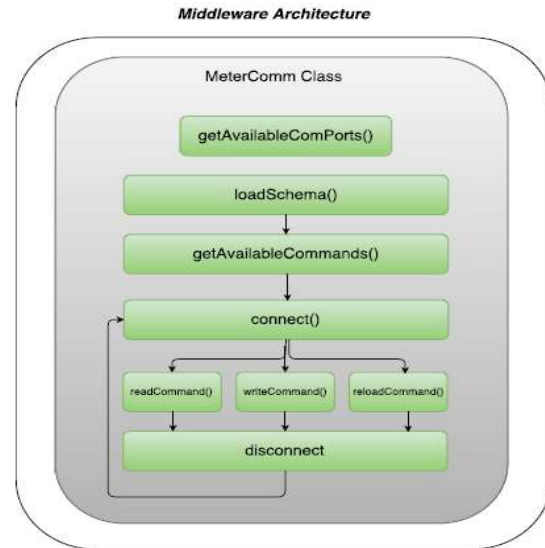


Figure 1. Diagram with the 'MeterComm' methods

Some functionalities in the DLMS standard follow the same procedure of the ABNT standard, because the same methods are used for the two standards. Figure 2 presents the methods and classes used to perform the reading functionality for the DLMS meter.

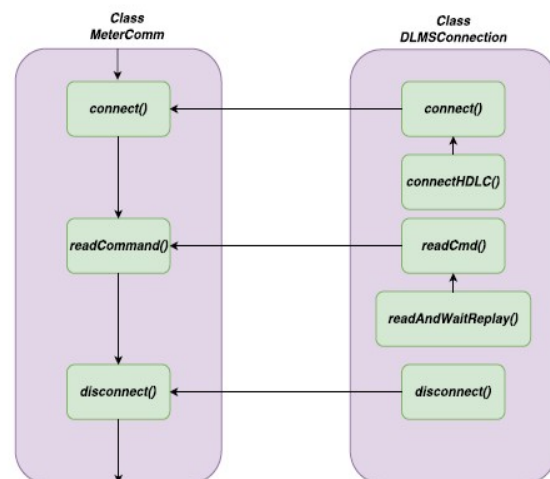


Figure 2. Diagram with methods and classes for communication with the DLMS meter.

A graphical interface was also developed for Olimpo. In Figure 3, a flow diagram shows the classes that are used for this interface.

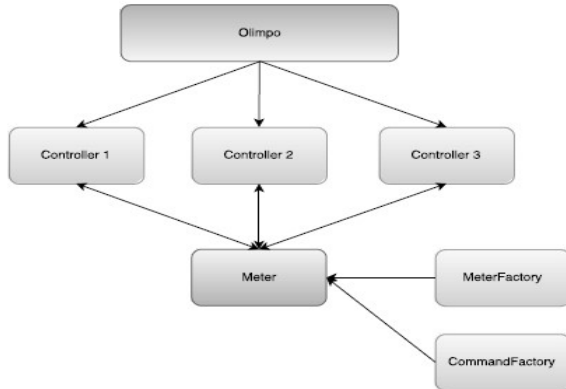


Figure 3. Diagram with the classes for the Olimpo's graphical interface

2. RESULTS

As result of this study, we have obtained a multiprotocol and scalable communication software for the power electronic meters that presents a refined graphic interface and good usability. Olimpo allows communication with the power meters via the ABNT or DLMS protocols, and it enables the addition of new types of meters with few settings. Figure 4 presents the simple reading screen of the reading request on the Cronos 8023 [4].

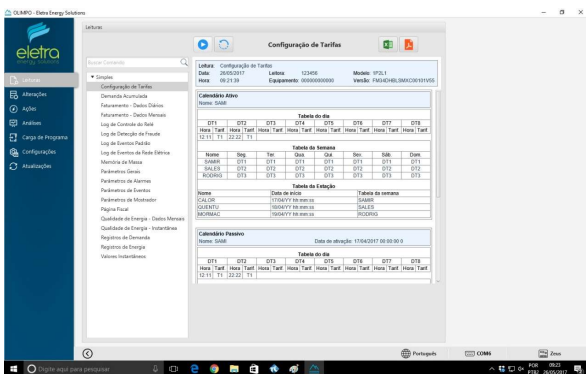


Figure 5. Simple reading screen of a reading request on the Cronos 8023.

4. CONCLUSION

The need for a multifunctional software that enables communication with THS (ABNT) and DLMS meters induced Eletra Energy Solutions to invest in a study to address this problem. This software has been used in the configuration and validation of the Eletra meters, and by some of the company's customers in Brazil.

Olimpo software presented good stability in its operation, with satisfactory results in the functional tests performed by the software TesteComplete, as well as presenting better usability feature and design than its competitors in Brazil.

5. REFERENCES

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