REMOTELY READ AND TRANSFER ENERGY METER PARAMETERS IN A RF AND IOT NETWORK

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INTRODUCTION

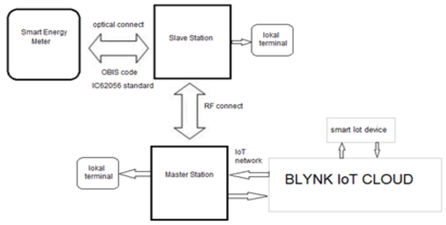
Electricity metering is a crucial component of electricity production, distribution, and consumption. Therefore, accurate billing for energy usage and timely calculations are of utmost importance. To eliminate the need for human involvement in data collection, automatic reading of meters is necessary (Garrab A., Bouallegue A., Ben Abdullah, 2012) (P, 2011) (B. S. Koay, S. S. Cheah, Y. H., P. H. Chong, P. Shum, Y. C. Tong, X. Y. Wang, X.Zuo and H. Kuek , 2003) (Himanshu K. Patel, 2018).

A significant issue with the equipment installed to date is that although the energy meters output measured values through a communication port, data reading, and collection are done manually on-site. This means there is no option for remote reading or data distribution through intranet or internet networks.

This paper focuses on the design and implementation of an electronic system that connects to these SEMs, allowing the transmission of measurement data both locally to a personal computer and remotely through intranet and IoT networks. Timely reading and calculation of the data obtained from electricity metering are crucial for accurate billing of energy usage. Therefore, to eliminate the need for human involvement in data collection, automatic reading of the meters is essential.

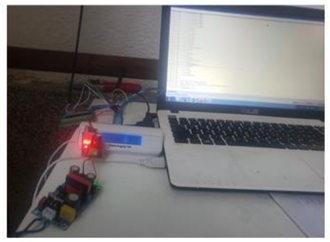
DESIGN OF THE PROPOSED ELECTRONIC SYSTEM

Figure 1 illustrates the connection of the SEM to a Slave station via an optical link, which consists of a dual configuration of an infrared phototransistor and an LED. This connection complies with the appropriate OBIS code and the IEC 62056 standard, as referenced in [7] (Citkuseva Dimitrovska, Biljana, and Zafirov, Elena and Stefanov, Goce, 2024) [8] and [9]. The Slave station is then linked to the Master station through a bidirectional RF connection, as noted in [10] and [11]. From the Master station, data is distributed using a Wi-Fi connection within the IoT network, making it accessible on a cloud server and via IoT mobile devices such as tablets and smartphones.

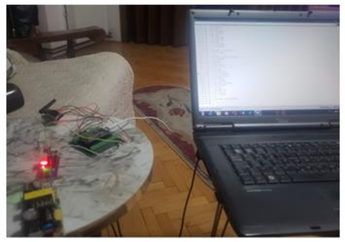


EXPERIMENTAL RESULTS

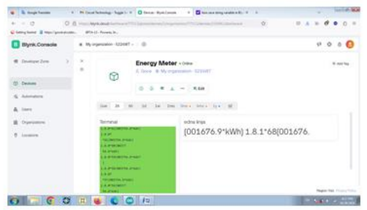
Figure 10a) illustrates the prototype on the Slave station, while Figure 10b) presents the prototype on the Master station, which is connected to laptop computers functioning as terminals. These laptops display the SEM parameters on their screens.



a) test bench at the Slave station



b) test bench at the Master station



Furthermore, the data collected from the proposed electric system can be transferred to a mobile device of our choice or stored on our cloud network. Figure 12a) illustrates a data screen on a mobile device displaying information transferred from an electronic system within the IoT network, while Figure 12b) shows a screen from the IoT Blynk cloud network. As a result, the electronic system designed in this way is connected to Blink Cloud. This allows users to transmit and access the parameters of the SEM from any other hardware linked to the same cloud channel, regardless of geographical location.

CONCLUSION

The paper presents the design and experimental realization of a prototypical electronic system for transferring and reading the parameters of installed energy meters from a distance. The system consists of two components: a Slave station located next to the energy meter and a Master station situated between 100 and 5.000 meters away. The connection between the Slave and Master stations is established using radio frequency (RF) modules, which are connected to smart NodeMCU microcontrollers at both stations.

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