

Design of an ARM-Based Power Meter Having WIFI Wireless Communication Module

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Abstract—AMR (Automatic Meter Reading) and PQ (power quality) management based on kinds of network technologies has become a trend. However, because of the high construction and maintenance costs with the existing meter reading technology, the applicability to different residential buildings and different network infrastructure should be improved, it is greatly significant to research new kind of power meter and the meter reading technology, which can accelerate the evolution of the Next Generation Network and facilitate people's lives. Now wireless broadband network develops rapidly. Generally WIFI is considered the commensurate scheme to resolve "the last 100 meters access problem", and WIMAX is regarded as the perfect scheme to resolve "the last 1000 meters access problem". At present, many cities in many countries are building or will build Wireless Metropolitan Area Networks by WIFI and WIMAX, it provides the new connection ways to the AMR system. This paper presents an AMR system scheme using WIFI technology and an ARM-based PMWCM (Power Meter with WIFI Communication Module) scheme. On the basis of the schemes, this paper designs the PMWCM hardware system and software system. The ARM-based hardware system is consisted of processor core board and peripheral board, and the software program is based on embedded Linux. This paper also proposes the functions of wireless communication module and design detail and discuss the security of the communications.

Index Terms—Power meter, AMR, WIFI, WIMAX, ARM

I. INTRODUCTION

With the rapid development of science and technology, it is possible to read and manage power meter data of residents by network remotely. The traditional manual Meter-Reading was not suitable any longer. On the one hand, it spends much human and material resource and brings about additional problems such as the security of entering house. On the other hand, the power management department can not collect the real-time data electricity being used. And with the power price reform, in order to make account rapidly, the power management department also needs more power parameters such as power requirement, time-sharing power quantity and burden curve. AMR (Automatic Meter Reading) can meet above demands. So, remote AMR and management through kinds of network technologies has become a trend now.

At present, most AMR system are generally based on such media as RF (Radio Frequency) [1-3], PLC (power line carrier communication) [4-6], GPRS (General Packet Radio Service)

[7-8], HFC (Hybrid Fiber-Coaxial) [9], and so on, to transfer data between power meter and manage center. All the above communication media have merits, but also have some shortcomings, such as short transmission distance, high transmission cost, difficult maintenance and unsafe data transmission. The shortcomings of PLC are that its communication signals can not go through the transformer directly and the low-voltage power line carrier is vulnerable to be impacted by the environment. It is real-time, wireless and extensive to use GPRS meter reading, but the cost of current GPRS module and the communications-cost are high. Until the cost reduces to the extent that ordinary people can accept, it can not be used widely. Reading power meter by wire is costly too. For in somepart it's hard to make net-line beyond the wall and make hole in the wall and in later period the maintenance cost is also high in network connection and security. In order to solve these problems, we can consider applying Wireless communication system WIFI (Wireless Fidelity), which is popularly used in the world, to transmit power data.

Now, Wireless broadband network develops rapidly. The WIFI [10-11] needs no wire and use the 2.4GHz frequency, which can be used reading no application in advance, so it is generally considered the ideal scheme to resolve "the last 100 meters connection". The network by WIFI can compose LAN (Local Area Network), and it is free to the user to communicate within LAN. So WIFI greatly reduces the construction and maintenance costs of AMR system. Further more, the WIFI LAN can connect to remote manage center by many ways, such as FTTH (Fiber to the Home), wire and the wireless. So power meter and AMR by WIFI is a preferable scheme to resolve the power data collection and the PQ (power quality) management.

Metropolians like New York, Beijing and Shanghai are building Wireless Metropolitan Area Networks with WIFI and WIMAX. The Wireless Metropolitan Area Networks provide a new connection method to the meter reading. With the existing wire-broadband connection ways, meter reading by WIFI will certainly has a good market prospects.

II. READING POWER METER BY WIFI

WIFI belongs to the short-range wireless technology which is used in offices and buildings. This technology is based on the IEEE 802.11 of wireless communications technology. It can work in the bandwidth near the 2.4 GHz which do not need any permission for use. Its currently communications standards is IEEE 802.11a, IEEE 802.11b, IEEE 802.11g and IEEE

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