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| 6LoWPAN Wireless Sensor Network for Smart Buildings Management |
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6LoWPAN Wireless Sensor Network for Smart Buildings Management

Prof Dr. Khaled Mohamed Fouad Elsayed

**Abstract:**

As a combination of data collecting, data transportation and data processing, Wireless Sensor Network (WSN) has a wide application range and becomes one of the hottest research focuses in wireless network area. With the development of WSN, large amount of sensor nodes are connected to Internet. However, the traditional IPv4 protocol isn't suitable for WSN due to its exhausting address space. While new features of IPv6 such as huge address space, security, and mobility would do a great favor. The combination of IPv6 and WSN would definitely accelerate the development of Wireless Sensor Networks. 6LoWPAN or IPv6 over LoWPAN is a technology of running IPv6 stack on the LoWPAN devices; we focus on designing a kind of WSN based on 6LoWPAN, to achieve direct communication between WSN’s nodes and IPv6 network. This thesis begins with the concepts, current situation and developing trend of WSN, then illustrates the basic technique of 6LoWPAN, IPv6, and IEEE802.15.4 protocol. Referred to the published 6LoWPAN’s internet draft, its core technology is research, which includes the detailed function, frame format, fragmentation and reassembly, header compression of adaptation layer and mesh supporting and so on. Combined with the characteristics of Contiki RTOS 2.5, we design and implement a 6LoWPAN star topology WSN based on Contiki Real Time Operating System (RTOS) 2.5. After that, we analyze its system framework, describe implements of system core programming, then construct a testing environment and do a test to the system. The experiment results show that the system works well, the sensor nodes can exchange data with the IPV6 network normally.

**CONCLUSION:**

Wireless sensor networks are becoming increasingly more prominent in all fields of today’s technology as can be seen by the numerous, and almost endless, applications in which they are involved in. The basic function of a wireless sensor network is to relay information about an environment of interest to a computer or human so that proper data computations and analysis can be made. This, in turn, will give WSN users such as researchers, the military, and even consumers a very detailed understanding of the environment they are studying. Also, the use of a wireless sensor network could dramatically increase quality of living in a number of ways such that if a health monitoring WSN application is being used on humans.

To create an internet of things and make it possible to directly address any number of objects needed through the Internet, IPV6 which has new header format, large address space, new protocol for neighboring node interaction (ND), and high-level security is used.

Basic wireless sensor network is composed of a variety number of sensor nodes, router nodes, and sink nodes deployed in an environment of interest. Each and every node is composed of three major layers that include the physical layer, the communication layer, and the application layer. The physical layer is the actual hardware components of the node while the communication layer and application layer instruct the node how to communicate and perform depending on the WSN application. Furthermore, the communication layer may be split up into three components of its own consisting of the data link layer, the network layer, and the transport layer.

IEEE 802.15.4 is the standard which specifies the physical layer and MAC layer for LR-WPANs. The standard uses carrier sense multiple access with a collision avoidance medium access mechanism. Many emerging standards and specifications are built on top of 802.15.4 including 6LoWPAN.

Since IPv6 requires support of packet sizes much larger than the largest IEEE 802.15.4 frame size, 6LoWPAN adaptation layer is defined. It is an adaptation layer between MAC layer and network layer which provides efficient header compression mechanisms avoiding information redundancy reduce the IP overhead headers to a few bytes, which is particularly interesting on links that only support small frame sizes.

Most of WSNs is low power and lossy networks. Concerning the routing protocol design in this type of networks, which should be sensitive to how much data a network can handle, the speed, and the devices’ capabilities, RPL is the desired efficient distance vector routing protocol with its supporting specifications on routing metrics, objective functions, and security. RPL operates at the IP layer according to the IP architecture, and thus allows for routing across Wireless sensor networks are becoming increasingly more prominent in all fields of today’s technology as can be seen by the numerous, and almost endless, applications in which they are involved in. The basic function of a wireless sensor network is to relay information about an environment of interest to a computer or human so that proper data computations and analysis can be made. This, in turn, will give WSN users such as researchers, the military, and even consumers a very detailed understanding of the environment they are studying. Also, the use of a wireless sensor network could dramatically increase quality of living in a number of ways such that if a health monitoring WSN application is being used on humans.