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Development of 6LoWPAN in Embedded Wireless System

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Abstract

In the proposed system, implementation of the low power sensor nodes is proposed. 6LoWPAN is an acronym of IPv6 over Low power Wireless Personal Area Network was developed to enable the Wireless Embedded Internet by simplifying IPv6 functionality, defining very compact header formats and taking the nature of wireless networks into account. Our solution contains two types of nodes Wireless Sensor Node and Border Router/Gateway Node. Wireless Sensor Node: These nodes have sensors integrated and are used to gather the information and send to the Border Router/Gateway Node. They create a mesh network among them, forwarding the packets of other nodes in order to make the information reach the Border Router/Gateway Node. Each Wireless Sensor Node is equipped with a 6LoWPAN (802.15.4) radio, sensors and a battery. It can be either a microcontroller based or Linux based embedded platforms. Border Router/Gateway Node: This node takes the information sent by the Wireless Sensor Nodes and sends it to the Tunneling IPv4 / IPv6 server by using the Ethernet IPv4 interface. Each Border Router/Gateway Node is equipped with a Linux based Single Board Computer, 6LoWPAN (802.15.4) radio and an Ethernet interface and a battery.

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1. Introduction

In today's world to provide internet based services to wireless sensor node there are wide range of technologies available but are difficult to integrate with larger networks. Some 40 years after it was created to connect computers to one another and allow file transfer, remote login, and access to distant computation, we find computational processing embedded in almost every device, machine, appliance, and instrument. And, they are

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increasingly able to communicate. These Bhosts hardly resemble their classic Internet forbearers, and rather than the human-generated information and documents that are exchanged over the classic Web, these deeply embedded computers present physical information sensor readings, observations, actions, and events that occur over time at particular points in the real world. The web of real world data is used to optimize production, improve safety, and reduce energy consumption, waste, and pollution. The emergence of this new tier of the Internet has largely been enabled by a decade or so of intense research on low-power wireless embedded networks, or sensornets. But early on, that thrust explicitly eschewed the design principles and constraints of the Internet architecture, arguing that conventional layering was impractical for the resource constrained devices that were being embedded in the physical world; that the underlying physical communication structure was essential to applications that would utilize such information and should not be abstracted away; and that without a human being in close attendance, these devices would need to configure themselves into networks without manual intervention. Ironically, this freedom of thought produced innumerable good ideas locked away in disjoint, no interoperable little stovepipes with little opportunity to impact the real world. At the same time, portions of the Internet design community were pushing on these very issues of accommodating huge numbers of hosts, auto configuration, and extensibility to embrace unanticipated innovation in IP version 6.

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2. Related Work

2.1 6LoWPAN

Low bandwidth, low-power resources and the maximum link-layer packet size of 127 bytes are the most relevant characteristics of the IEEE 802.15.4 [2] standard. Implementing standard IPv6 headers over LoWPAN would result in extremely small payloads for higher-level protocols The IEEE 802.15.4 standard is broadly accepted as the PHY and MAC layer protocol for WSN. The network layer protocol must comply with the constraints imposed by the lower layer protocol in use. In fact, the requirements of the IPv6 protocol don't fully match with the IEEE 802.15.4 constraints. MTU is 127 bytes. Beside to this incompatibility, using standard IPv6 headers would result in extremely small payload for high protocols. To address these issues, the IETF 6LoWPAN-working group were created to define the support of IPv6 over IEEE 802.15.4.

The 6LoWPAN [5] working group were mainly focused on the following items: *i*) to define limited extensions to IPv6 neighbour discovery protocol more adapted for WSN; *ii*) to describe mechanisms to compress 6LoWPAN headers and *iii*) to define 6LoWPAN routing approaches and protocols adapted to WSN characteristics. Instead of defining a single header, like IPv4, the 6LoWPAN use stacked headers as the original IPv6 protocol does. In this case, it does not need to use unnecessary header fields for mesh networking or fragmentation and it uses only the minimum necessary headers. The 6LoWPAN standard defines four header types: *i*) the dispatch header, *ii*) the IPv6 header compression header, *iii*) the fragmentation header, and *iv*) the mesh header. In the simplest case, only the dispatch and compression headers are used. At the beginning of each header, a header type field identifies the header format.

3. Proposed System.

The proposed system includes realization of communication based on the cc2520 and 6LoWPAN subsystem on a cheap and low power embedded platform supporting Linux.The term 6LoWPAN is referred to WPAN network having IPV6 based protocols. As most of the networks deployed are based on IPV4 there is a need to interoperate legacy IPV4 with newly introduced IPV6 network.