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IMPLEMENTATION OF SNMP (SIMPLE NETWORK MANAGEMENT PROTOCOL) ON SENSOR NETWORK

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Abstract: Implementation ***of SNMP on WSN is a measure solution for the management of network in the IPv6 based network on TCP/IP using Contiki software. In this paper the implementation is shown with its output results using contiki applications. In this the packet is transmitted in Wireless sensor network from one node to another in mesh topology with maximum encryption using SNMP showing the details of packet i.e. payload length etc. and IP addressing using location of sensor node.***

Keywords: Contiki software, Server and Client nodes, IPv6, SNMP, WSN.

I. INTRODUCTION

To monitor the surrounding on board sensors are used by low power devices in WSN. WSN are not always easy to connect with the other networks in real world which make it different and even difficult to connect without a gateway device. For this task standardized protocols based on internet protocol network and others methods are used which are already in use. The main task of a gateway is monitoring of network and this is not a new activity in WSN. The IP network based solutions for monitoring of network and for its management is done by SNMP[6].

Ting OS is used operating system in WSN which made it possible to use the advantages which are commonly brought up by IP layer. It also includes reuse of protocols, software which we already use and are developed and the techniques based on IP networks[20].

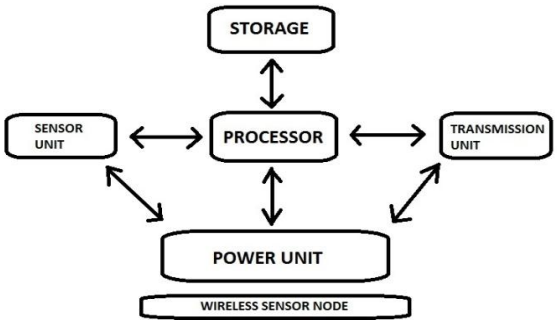

Figure1: Wireless sensor node

SNMP is a User Datagram Protocol which is used for management of network and monitoring in IP based network. Version 3 of SNMP i.e. SNMPv3 has security overhead that are not present in other versions. In the implementation of SNMP agent in WSN operating system TinyOS is used, which shows the basic functionality of SNMP which brought some of the benefits of IPv6. An agent of SNMP will interpret and the SNMP messages produced mean that no gateway operations would necessarily be present. The advantage is that no alterations or additions can be made in network stack which is used in network.

The main objective of my research is to implement an SNMP on WSN which responds with transmitted SNMP messages and receive SNMP messages. This software consists of SNMP agents which can be used in monitoring and managing WSN's[24].

II. METHODOLOGY

A. IMPLEMENTATION METHODOLOGY

Concern of IPv4 addressing was space limitation which is solved by IPv6 addressing with millions of addresses. One or more gateways are used for connection in IP network to WSN and to route packets from IP network to the WSN we use this IP address. In WSN, destinations could be uniquely addressed by a UDP port number of client and server with the location mentioned. We recommend using private port numbers ranging from (49,152 to 65,537), for this purpose. It has more than 16,050 nodes in a WSN and each node will support one addressable destination which is mentioned with the port. If more destinations are needed in a WSN, then from the UDP registered port number, we could use unused port numbers. This approach will resolve addressing issue in IPv4 but in IPv6 we can use other ports also as there is no issue of addresses in it. In this addressing scheme, an IP network could route a message to the gateway for a WSN and with the implementation of a mapping scheme between port numbers and WSN destinations. A gateway could then forward the message to the correct destination i.e. to server with its location displayed.

Within a WSN a destination is uniquely identified by a node ID and an endpoint ID. These are identified logically. An endpoint ID is used to identify an endpoint within a node in sensor networkin this process. An endpoint entity could be physical or a logical or an application within a node. TinyOS [2] and ZigBee [9] both support this end point entity. In ZigBee we uses 8 bits to identify an end point within a node where as in TinyOS, one could use AM (Active Message). In TinyOS an 8-bit value [8] is used as an entity or end point within a node. Basically there are two approaches which tell us how a WSN could logically view or show a destination in an external IP network. It could be viewed as an endpoint at the gateway node or an end-point at a separate node and this could be reached through the gateway node. 8 bit endpoint identifier is uses only 256 or less IP destinations that could be supported if a WSN has only one gateway. If we view an IP network destination as a WSN endpoint destination then a

separate node can be used and enough flexibility is present in terms of the number of IP endpoints that is supported in WSN. Therefore, each IP destination is suggested to be assigned in a WSN node ID and endpoint ID[9].

B. SOFTWARE USED

Contiki software is used for the implementation of the SNMP on WSN, and this software uses cooja as a simulator. The programs in contiki are written in NesC language where the semantic programs are written in java. Contiki software is a new software specially designed for wireless networks. It is designed for both the commercial and non-commercial uses. It is designed for TingOS which helps in efficient use of memory. It also supports low power IPv6 networking and even other LoPWAN.
Preferred languages for programming in contiki: NesC and java[2].

C. IMPLEMENTATION OF SNMP ON SENSOR NETWORK

The implementation of SNMP on sensor network is done in contiki software using cooja simulator and this implementation is done on Tmote sky. The figure shows the compilation of the program and after this we can assign the motes so we can do simulation.

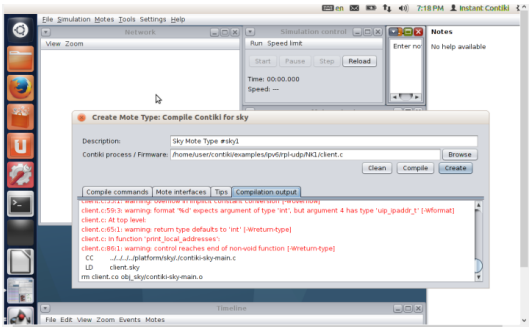

Figure2: Showing the successful compilation of the program.

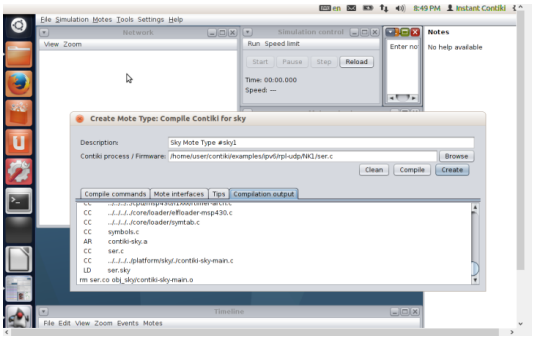

Figure3: Showing the successful compilation of server program.

In my work I have selected 5 motes, in these motes one is the server mote (Tmote sky) and the other is client. The client node will send the data to destination through routers which check the destination address of server and send it to the appropriate node i.e. the destination. The program in the client node is written in the NesC language which is a standard language (Standard form of C). The server node will collect the data and display this data on the PC. The program on the server mote (Tmote sky) is written in java language which is a semantic language for our compilation in contiki software.

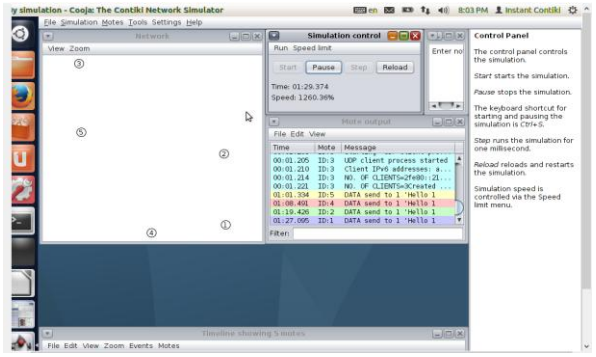

Figure4: Shows the running program with motes set(Tmote sky) and displaying output.

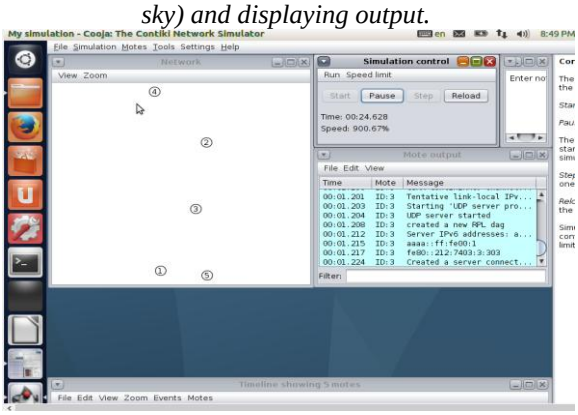

Figure5: Showing the simulation of server program.

The output of the simulation is shown below in the figure, where it describes details of the IPv6 addresses used with the declaration of the ports of client and the server. It contains the data payload size and other details i.e. time interval and power used for transmission. It displays the data “HELLO” with the location details.

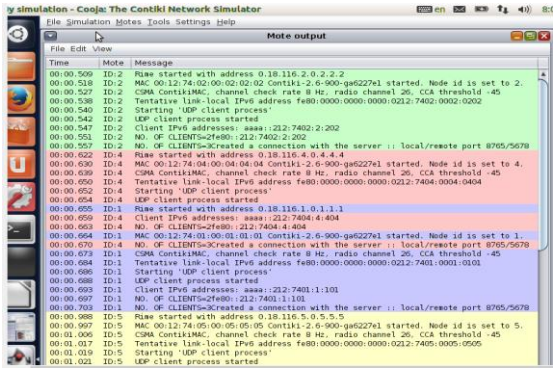

Figure6: Showing the output(1) of client program

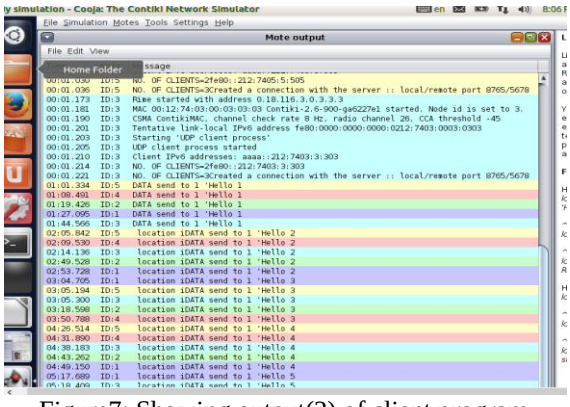

Figure7: Showing output(2) of client program

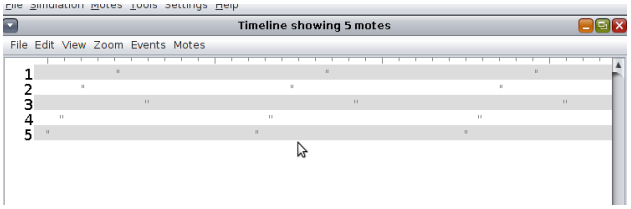

Figure8: Showing motes output of client program.

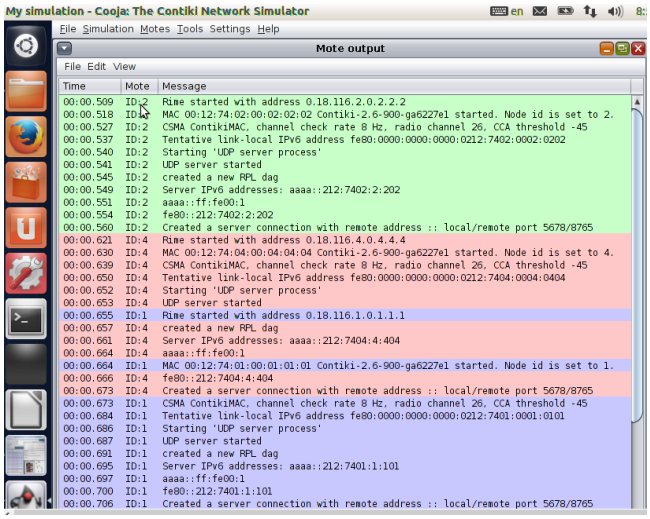

Figure9: Showing output of server program(1)

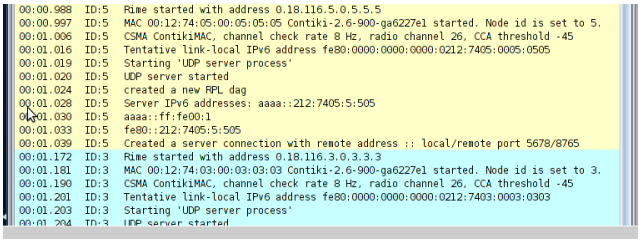

Figure10: Showing the output of the server program(2)

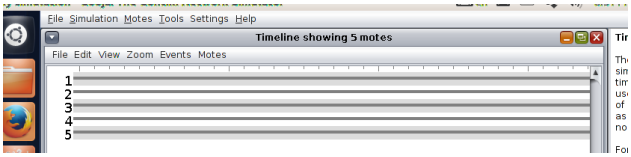

Figure11: Showing the motes of server program.

D. CONCLUSION AND FURTHER ADVANCEMENTS

I have successfully implemented SNMP (Simple network management protocol) on wireless sensor. And I have successfully displayed the IP addresses, the location of the server with the data, no. of clients and other useful details of the data i.e. payload size using IPv6 addressing in TCP/IP. We can further do amendments in this by adding the battery status. I have used one client and one server by mentioning the port no. but further we can even do this for multiple clients and server.

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