Review of Routing Protocol in a Wireless Sensor Network for an IOT Application

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Abstract: IoT (Internet of Things) create network of physical objects. Maximize network lifetime and optimizing the usage of network is the major objective. Survey is made on Delay, Energy, Jitter, Throughput, Packet Delivery Ratio (PDR) with Wireless Sensor Network (WSN) perspective and the routing protocols performance measures by using latency, bandwidth, jitter, delay. We are working on algorithm for improving AODV routing for IoT. Two Table will merge into one i.e. Routing table and internet connecting table for optimizing the protocol. The main goal of our paper is studying simulation study of routing protocol specially AODV for the IoT and use NS2 simulator for performance evolution of AODV and AODV with IoT.

Keywords: Internet of Things (IoT); Routing; Wireless Sensor Networks (WSN); Scalability; QoS**.**

Date of Publication: 2018-09-15

Volume: 01 Issue: 02

Journal: Computer Reviews Journal

Website: https://purkh.com

I. INTRODUCTION

IoT is the Internet of Things. IoT having a global network for monitoring and controlling the physical world. It can be access through the smart devices for collecting, processing and analysis of generated data by IoT sensor devices.

These types of devices control and manage remotely by using the built-in sensing and communications interfaces like different sensors, RFID (Radio Frequency Identification Devices), GPS (Global Positioning Devices), Infrared Sensors, LAN (Local Area Network), WLAN (Wireless Local Area Network). These types of devices communicate Machine–to-Machine (M2M) for transferring data, sensing temperature and pressure in environment. For transmitting data to other devices by using wired or wireless technologies. In the term of IoT research organization decade back to provide a communication channel between the smart devices and its services available over the internet. [1-2].

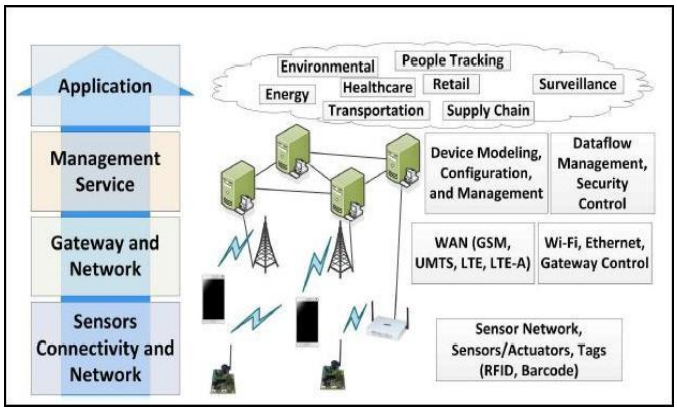

Figure 1: Architecture of IOT

To Achieving some useful objective the IoT devices are integrated with some of processing, sensing and networking capabilities. [3]

The IoT devices are establish connection to the other devices to transmit information using an intertransfer protocol. In IoT, devices consist Bluetooth, WLAN (Wireless LAN), Different types of sensors, RFID (Radio Frequency Identification), GPS (Global Positioning System), infrared etc. [4]. To capture more amount of data from different areas, we need this type of connectivity. IoT is an intermediate between device, sensors and the data networks. Issue in IoT devices is interoperability among communication devices and services. The communication devices should be flexible in adopting the situation in carrying information with less human involvement [5]. A wireless Sensors Network (WSN) consists of many sensors which consume low power and multi-functional operating in an unreachable environment, and having capabilities of sensing, computation and Communication. CPU (Central Processing Unit), ADC (Analog to Digital Converter), sensor unit, power unit and a communication unit are the basic component of a nodes. [6] By the recent advance in MSME is Micro Electro Mechanical Systems technology. MSME ramping up of sensors has been made potential. A unit of processing, limited memory, battery inform source of information about the limited computational and sensors are the components of sensor nodes. WSN is used to gathering data with the help sensor nodes. Sensor nodes are MEMS (micro–electro–mechanical systems). [7] Physical condition like environmental temperature and environmental pressure in measurable by MEMS. Physical data measure by using sensor nodes to be monitored. The sensors sensed analog signal and analog-to-digital converter digitized signal sent to controller for further use. Size of sensor node are very small, extremely low energy consumed, operated in high volume density and can be adaptive and autonomous to the environment. Sensor nodes (SN) is low power device consists by WSN. Sensor nodes are divided over the area to be measure the atmospheric variations. SN communicate with each other and form a network. One or more number of SNs among network will act as the sink that will bring the direct communication with users. Sensor is the important component of WSN that helps

to collect the environmental conditions in different areas. Data processing, communication, leveraging the network with more SNs are the important functionalities of SN.

The following Figure.2 represents the architecture of WSN consisting of different units like processing unit, sensing unit, power unit and communication unit [8].

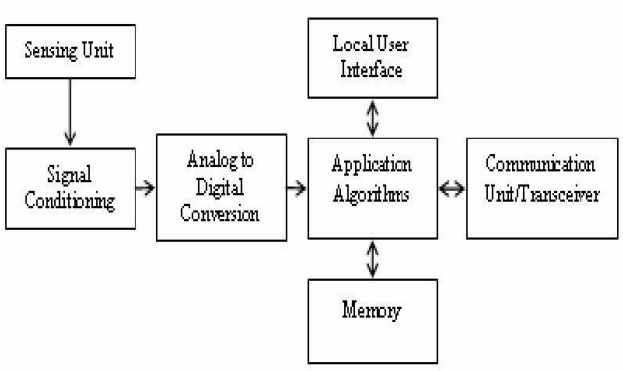

Figure 2: WSN Architecture

Some sensors and ADC (Analog to Digital Converter) are the part of Sensing unit. ADC and some sensor are collecting the data and return back the sensed data.

Sensor Node send collected data to ADC for sensing the data for the further action is the key function of ADC. Communication unit is receiving the query or command from the transmitted data from CPU (Central Processing Unit) is function of Communication Unit. CPU is to interpret the query or command to ADC and monitoring & controlling the power over the received data and computes it to sink which function done by CPU.

The power unit function in WSN used to supply power. Every unit of Sensor Node finding location finding (used to find the location) and mobilize units (used for moving the sensors). The Sensor Nodes performs the computing and transmitting the required data over the network.

Sensor Node is playing a function of router to communicate with battery constrained Wireless network. WSN is low power, scalable, fault tolerant network and the cost is very less as well as maintenance free. The Wireless Sensor Node is use to work in certain bandwidth.

II. LITERATURE REVIEW

In Internet of Thing (IoT) are mainly communicating from source to target devices which helps to process, store and analysis the information. Efficient protocols must support for data communication between the low energy consumption devices. [9]

Routing is process to transfer data packets from source to destination, maintain the route between node in wireless network it is also help us to select the shortest path for communication.

It consists of a reactive, proactive protocol and hybrid protocol (combination of reactive and proactive protocols). Reactive protocol: Reactive routing protocol is not contain any information about the nodes and the routes that are formed. Most probably this kind of reactive routing is used in dynamic networks which support continuous changes in topology.

Every time IoT supports different dynamic topology, so that reactive routing has a special in it. AODV, AOMDV, TORA, SEER, LOADng, TEEN are the routing protocols.

1.AODV: AODV is a routing protocol. AODV is very simple an its very effective and efficient. AODV helps to construct the routes to appropriate targets. In AODV, Loop Free issue will be resolve by adding the sequence numbers of targets. AODV consists of three different message types. Route discovery will be performed by Route Request. Final routes will be decided by Route Replies.

Link breakage error messages are warned by Route Errors in an active route in a network. AODV maintained a routing table to keep the route record.

2.**TORA**: TORA stands for Temporarily ordered routing algorithm. TORA is an on-demand routing protocol. Link reversal algorithm used by TORA. TORA perform three operations between nodes.

1) Create the route.

2) Erase the route.

3) Maintain the route.

3.SEER: SEER stands for Spectrum and Energy Efficient routing protocol. [13] SEER is used to increase the lifetime of network. The advantage of this protocol is scalability. SEER is performed Distance calculation and residual energy available in sink node the route decision. In SEER the energy efficiency is high. If we view the of summary the SEER is reactive routing protocol will reduce the power consumption and having excellent scalability compare to AODV and TORA.

Proactive protocol: Proactive protocols are mostly used in static networks where the topology can be changed only once not more than one time. This proactive protocol saves information in the form of table (combination of rows and columns) it is nothing but a routing table. Proactive protocols known as "Table-driven protocols", because routing will be based on routing table. LEACH, GEAR, OLSR, DSDV, RPL, GPSR are the different forms of proactive protocol.

4.OLSR: Optimized link state protocol (OLSR) [14] is successor of algorithm of link state. To maintain a proper topology of the network at each and every node, it involves in exchanging messages periodically. For minimizing the size of packet and retransmission of packets OLSR perform optimization by using Multipoint Relay flooding and messaging. OLSR provides shortest route between number of hops.

5.GPSR: GPSR Stands for Greedy Perimeter Stateless Routing. [15] GPSR gives permission to a node to transmit message to their closest neighbor. A node wants to remember the location of neighbor within a single-hop.

Greedy forwarding algorithm is used to calculate distant between the nodes. For the routing decision GPSR perform very important role to take a dynamic decision. In the view of summarizing the proactive routing protocol, GPSR protocol consists of good performance, and low overhead compares to OLSR.

6.Stephan Haller [16] studied the things in the IoT (Internet of Things). This paper tries to bring clarity by describing the most significant terms like things, devices, entities of interest, resources, addressing, and identity and, more importantly, the relationships between them.

7.Yicong Tianet [17] designed a routing method that can take function as routing target not just nodes.

In this method, the development is suitable for use in IoT (internet of things).

Interrelate with AOMDV in the internet of things, simulation results show that AOMDV-IOT achieves improve performance in average end-to-end delay, packet loss and discovery frequency.

III. IMPLEMENTATION

The implementation section discusses how AODV protocol was implement and analyze for the comparison. Fedora being chosen for implementation, providing stable and robust platforms. NS2 being used for Network

Simulation using scripting & Gnuplot for plotting of graphs. Figure 3 NamFile shows Communication Process of WSN Network indicating Communication between the nodes.Process finds QoS Parameter Delay, Jitter, Throughput, Energy and ratio of Packet Delivery.Share of Bandwidth by application network i.e.Throughput is calculated.Bandwidth being the available network path for a particular Communication is shown.Time required by a packet to reach from source to destination ,if packet is delayed then computation of average delay is carried out in the implementation process.The process defines the number of data packets delivered giving the Packet Delivery Ratio.The implementation part is showing the packets too that are dropped in other links.

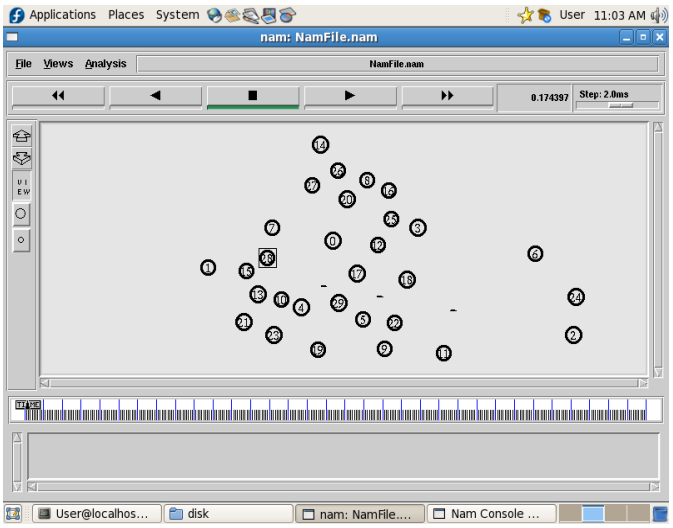

Figure 3. Communication Process of WSN Network

In Figure 3 shows the communication process of WSN (Wireless sensor network) in which the source node starts to transfer information to sink node using AODV protocol, by using this process we can find out the QoS parameter like Delay, Jitter, Throughput, Energy and ratio of packet delivery.

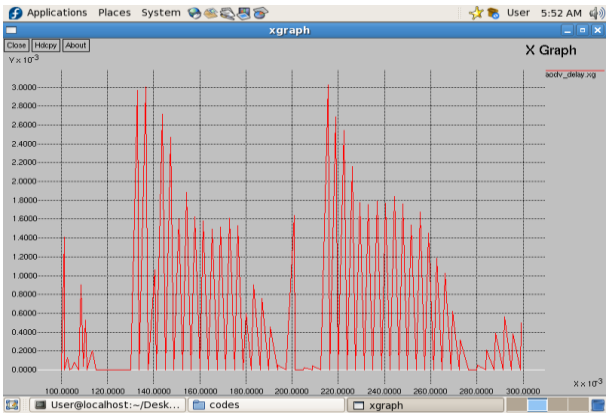

Figure 4. Analysis of Delay vs Time

Figure 4 shows the analysis of delay vs time, by using simulation process we can reduce the delay.

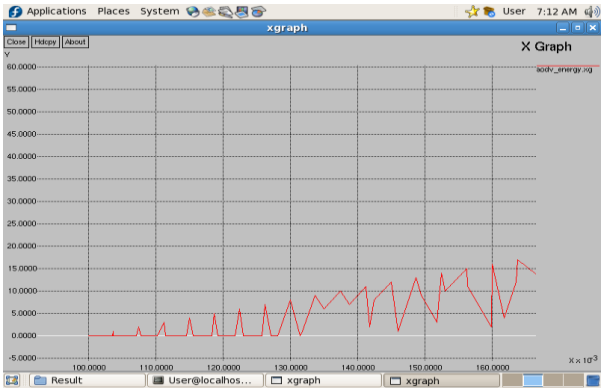

Figure 5. Analysis of Energy Vs Time

Analysis of Energy Vs Time the Energy of AODV is good than all other protocols. By making communication between source and target. AODV protocol is reduced the energy. This Energy vs time graph is shown in figure 5.

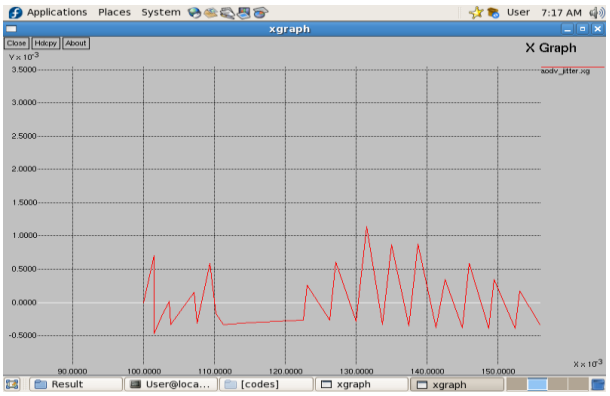

Figure 6. Jitter vs Time

Jitter vs Time AODV reduce the network jitter. The Jitter vs Time graph shown in figure 6.

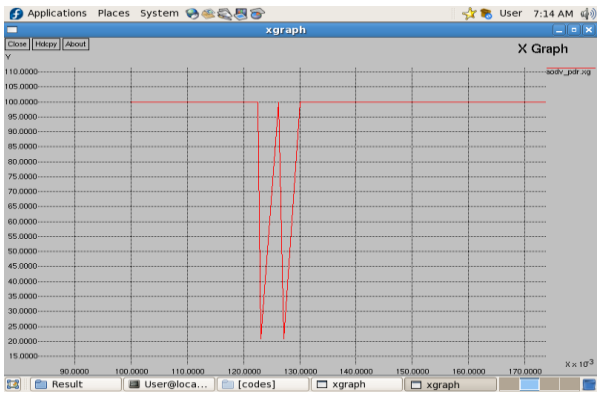

Figure 7. PDR vs Time

PDR vs Time the PDR or packet delivery ratio of AODV is good than all other protocols. It is usually 100% for all the communications which take place. This PDR graph is shown in figure 7.

IV Conclusion

Conclusion of this paper we are analyzing the AODV is a routing protocol for data transfer over wireless network using NS2 simulation for QoS parameter like Delay, Energy, PDR, Jitter and Throughput. In this simulation process we can reduce delay, energy and throughput by sending maximum packet through source to destination i.e. ratio of packet delivery and increasing jitter value. In my research, I first implemented the above system in a real time sensor network, and then upon validation of results, we implemented the same module in Network Simulator version 2.34, and verified its results.

V Future Scope

Scope It had been observed that packet data send to destination through source node, but for calculation distance and energy we have to design algorithm is that way where we will apply QoS parameter by reducing the delay, energy and throughput by maintaining packet delivery ration also concern about the increasing jitter. AODV routing protocol performance would be seen for the IoT (Internet of things). In order to improve the algorithm, the protocol will be optimized such that routing table and internet connecting table will merge into one.

References

[1] G Kortuem, F Kawsar, V Sundramoorthy, D Fitton. Smart objects as building blocks for the internet of things. IEEE Internet Computing. 2010; 14(1), 44-51.

[2] K Ashton. That 'internet of things' thing. RFiD Journal. 2009; 22(7), 97-114.

[3] A Whitmore, A Agarwal, L Da Xu. The Internet of Things—A survey of topics and trends. Information Systems Frontiers. 2015; 17(2), 261-74.

[4] K Zhao, L Ge. A survey on the internet of things security. InComputational Intelligence and Security (CIS). 2013 ; 663-667.

[5] K Rose, S Eldridge, L Chapin. The internet of things: An overview. The Internet Society (ISOC). 2015; 1-50.

[6] Lewis, F.L. Wireless Sensor Networks. Automation and Robotics Research Institute, The University of Texas at Arlington: Ft. Worth, Texas, USA, 2004; pp. 1-18.

[7] Younis, M.; Youssef, M.; Arisha, K. Energy-aware routing in cluster-based sensor networks. In Proceedings of the 10th IEEE/ACM International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems (MASCOTS2002), Fort Worth, TX, USA, October 2002.

[8] Yogeesh A C, Dr. Shantakumar B Patil, Dr. Premajyothi Patil, A Survey on Energy Efficient, Secure Routing Protocols for Wireless Sensor Networks, in International Journal of Engineering and Computer Science, vol. 5, Issue 8, pp. 17702-17709, August 2016.

[9] K Machado, D Rosário, E Cerqueira, AA Loureiro, A Neto, JN de Souza. A routing protocol based on energy and link quality for internet of things applications. sensors. 2013; 13(2), 1942-64.

[10] C Kharkongor, T Chithralekha, R Varghese. A SDN Controller with Energy Efficient Routing in the Internet of Things (IoT). Procedia Computer Science. 2016; 89, 218-27.

[11] C Perkins, E Belding-Royer, S Das. Ad hoc on-demand distance vector (AODV) routing. 2003; 1-37.

[12] B Bellur, RG Ogier. A reliable, efficient topology broadcast protocol for dynamic networks. InINFOCOM'99. Eighteenth Annual Joint Conference of the IEEE Computer and Communications Societies. Proceedings. 1999; 1, 178-186.

[13] GP Hancke, CJ Leuschner. SEER: a simple energy efficient routing protocol for wireless sensor networks. South African Computer Journal. 2007; 2007(39), 17-24

[14] P Jacquet, P Muhlethaler, T Clausen, A Laouiti, A Qayyum, L Viennot. Optimized link state routing protocol for ad hoc networks. InMulti Topic Conference. 2001; 62-68.

[15] B Karp, HT Kung. GPSR: Greedyperimeter stateless routing for wireless networks. InProceedings of the 6th annual international conference on Mobile computing and networking. 2000; 243-254.

[16] Stephan Haller,The Things in the Internet of Things, Internet of Things Conference 2010, Tokyo, Japan. http://www.iot2010.org

[17] Yicong TIAN, Rui HOU, An Improved AOMDV Routing Protocol for Internet of Things, 2010 IEEE.

[18] Poonam Thakur, Rahul Pethe, G. M Asutkar, SA Chaturvedi," Analysis of Routing Protocol for Different Packet Size Data Transfer over WSN" IJERECE, March 2017.

[19] DP Mishra ,SS Dorale,G M Asutkar," An application of Wireless sensor Network in Intelligent Transportation System" ICETET,2013.

[20] MS Masurkar,GM Asutkar KD Kulat ," Lifetime maximization in wireless sensor network using cross layer design: A design Review,ICETET 2008.