A Review on Energy Efficiency in AODV Routing protocol for Internet of Things

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Abstract— (IOT) stand for internet of things which mean enables the interaction of things or objects with each other or in the surrounding environment. "Smart" objects, embedded with Radio frequency identification (RFID)are the key element for internet of things .These objects which is gconnected are provided with the unique identities that addresses each device uniquely in the network. The internet of things is enabled by the latest developments in RFID, smart sensors, communication technologies, and Internet protocols. Routing is a major concept in adapting the internet of things vision as nodes must connect or communicate and exchange information efficiently with each other. A big challenge for IoT is to design a routing algorithm that to adjust the frequent and erratically moving or changing the network topology which cause the consumption of the energy and that lead to reduce the lifetime of the network .In energy efficient communication schemes for Manet ,Sensors etc from past years. But the studies not examined in the concept of IOT. By this introduction we are going to plan for cost effective arrangement of the objects to Ensure an Energy Efficient and deploy for the same in any of scheme of internet of things. In this paper we discussed some routing protocols .And for future work we are going to prepare framework model which is suitable to deployment of IOT.

Keywords—IOT,AODV routing protocol, energy efficient routing protocols based on AODV.

I. INTRODUCTION

A rising quantity of physical objects are being connected to the Internet at an outstanding rate realizing the clue of the Internet of Things . Thermostats ,HVAC (Air condition , Heating) and control system that enable smart home are the basic example of objects. There are domains andenvironments that the internet of things play a remarkable part and enhance the excellence in our lives. These tenders include healthcare, transportation ,industry ,and emergency response to natural and man-made disasters where human decision making is difficult.[1].The internet of things (IOT) and devices can be connected typically based on the battery power source and therefore, energy efficiency is obviously of utmost significance in device management.so considering energy efficiency for the battery operated sensor nodes, also wireless sensor network domain, and lifetime extend have been research problem for prolong [2,3],where the duty cycle for sensor nodes ,and routing layer protocols based on Medium Access Control(MAC) layer,and designed for data aggregation and many-to-one transmission. Likewise , since the internet of things devices operating in the IOT network model are also battery operated ,energy consumption should be kept in mind during IOT network deployment[4].

II. ARCHITECTUREOF THE INTERNET OF THINGS

The internet of things is one of the important concept in the upcoming days ,so the IOT should be able of connecting billions or trilions of objects over the internet .furthermore there is a serious requirement for the layerd architecture[1].

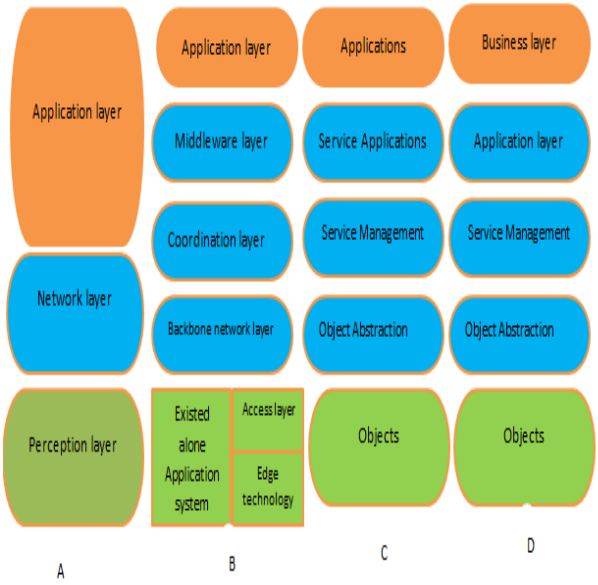

Fig 1: Architecture of the Internet of Things

A. Objects Layer

The object layer denotes the physical sensors of the internet of things that aid to gather and process information .The first layer is the objects or the perception layer, this layer includes sensors and actuators to perform different functionalities such as query position, movement, weight, humidity etc.

B. Object Abstraction Layer

The object layer produces the data and the object abstraction send that data which produced from the object layer to the service management layer over secure channels data can be transferred through different technologies which can be as RFID,UTMS,WIFI Zigbee etc. Moreover, other functions

like data management processes and cloud computing are handled at this layer

C. Service Management Layer

The service management layer is based on the names and addresses. This layer allows the internet of things application programmers to work with heterogeneous objects without reflection to a precise hardware platform. Furthermore, this layer processes received data, creates decisions, and sends the required services over the network wire protocols.

D. Application Layer

In this layer, the customers can be asked for some changes or some service.so this based on the application layer which provides the services based on the request of customer. For example, the application layer can provide air moisture measurements and temperature to the customer who request for the data. The application layer is important layer for the internet of things which has the ability of providing a high quality smart services to meet customers requirements.so the application layer can cover many crucial markets such as smart building, smart homes, industrial, transportation and smart healthcare.

E. Business Layer

The internet of things activities can be manage by the business layer ,also the services of IOT.The tasks of this layer are to make a business model ,flowcharts,graphs,etc,it is also given to analysis, design ,implement, monitor and develop the internet of things system related elements.

III. ELEMENTS OF THE INTERNET OF THINGS

Fig 2: Elements of IOT

To know about internet of things creating block helps to get much better insight into the real understanding of the internet of things and its functionality. There is a few main elements of IOT which gives better functionality for the internet of things which can be as [1] :

A. Identification

Identification is one of the most important elements for the internet of things to match and name services with their request.so the distinguish of the identification is essential in order to make deference between eatch object and address to make addressing for the internet of things .Furthermore,the differentiate is more important in order to make since the identification not unique.

B. Sensing

The internet of things can be collected data from many related objects inside the network and forwarding it to a database ,data warehouse .The collected information is investigated to take exact action depend on the request services. The internet of things sensors can be as actuators and smart sensors.

C. Communication

The IoT communication technologies connect heterogeneous objects together to deliver specific smart services.

The internet of things can be connected heterogeneous objects with each other and deliver a precise smart services.

D. Computation

Computation element is the interaction of the hardware and software, so the hardware sample can be as the smart things, smartphone etc, software sample can be as the OS(contikti ,tinyos etc.)

E. Services

Service is one of the most important element for the internet of things and the sample of this element can be as the information aggregation ,(smart grid) collaborative-aware (smart home) etc.

F.Semantics

Semantic in the internet of things denoted to the capability that can be extracted the knowledge rapidly by various machines to deliver the needed services.The Knowledge contains modelling information and using resources .

IV. CHALLENGES OF THE INTERNET OF THINGS

The internet of things (IOT) is one of the most crucial concept in the upcoming days which can make a connection with millions /billions of smart devices and sensors that can be connected in homes ,offices, cities and also on our persons to reduce energy consumption ,improving efficiency and better understanding how we connect with our environment .so the challenges on the internet of things are important in order to make suitable benefit of the IOT, There are some challenges in the internet of things which can be as :

A. Energy efficiency

The Energy efficiency is one of the most crucial challenges in the Internet Of Things, the process of distribution of battery-driven nodes running independently for tighted periods of time is one of the bases of the IoT. The routing protocol which is creative in terms of power depilation is dynamic to the functionality of an Internet of Things based network. tied to these efforts closely is the topic of power-awareness. The protocol is able to connect its nodes

limitations is able to make more informed routing decisions based on this information [5].

B. Security

Security is one of the most imporatn challenges in the Internet of things fields ,internt of thigs have been turned into a serious security part that has drawn attension to a security .the hacking to smart fridges cameras etc are predicting a security nightmare being caused by the future of the internet of things .so the security is crucial concern for the intenet of things field.

C. Connectivity

Connectivity is one of the biggest challenges in the IOT ,where there are many devices will be connecting and exchange the packet data between each other.As of now days we depend on the centralized ,server/client paradigm to connect different nodes in the network, when there are tens ,hundreds or even thousands of devices be connected ,but when the networks grow to connect billion and hundreds of billions of devices , there must be a huge of investments and spending in maintain the networks ,and this can be a big challenges in regarding the internet of things .

D. Compatibility and Longevity

The compatibility and longevity are challenges of the internet of things where the internet of things is rising in various directions ,with different technologies ,this will basis difficulties and need the distrubuation of more hardware and software when its connecting the devices.

E. Standards

It is one of the crucial challenges in the internet of things ,the standards include network protocols, communication protocols etc. The challenges of standards with the internet of things can be as the standard for handling unstructured data and the technical skills.

V. ROUTING PROTOCOLS FOR INTERNET OF THINGS

Thee routing protocols are many exist and having a unique operating standard with the performance related to the wireless sensor network which is deployed for the internet of things with a some modification for bandwidth and power energy consumption.so there are a few of the wide types of routing protocols can be discussed in this section.[6]

A. Naive Routing

The idea of naïve routing is flooding.so The flooding is the way to distribute routing information updates quickly to every node in a large network.The node hear the other neighbours nodes within its range. Destination nodes reply with a route reply message to the beacon .Popular routing protocols such as AODV,DSR,and DSDV fall under this category of the routing protocols. However , this flooding creates overhead in the network called beacons. The communication link can be establish between the nodes based on the destination nodes respond with the path reply communication to the highlight.

B. Hierarchical Routing

Polling is the concept that the nodes form clusters based on it.The responsibility for all communication on behalf of the fellows of the cluster is the cluster head. Group motion can be better by the cluster head subsequent some metric to devise the flexibility design of the nodes in the cluster.

C. Multipath routing

Multipath routing is one of the important routing protocol where different routes can be used over the network. This protocol use in the concept of the internet of things to enhance security and make a huge bandwith.The protocols employing can be used various of route to reach the destination and the sending packets among many nodes can save the energy .

D. Probabilistic routing

The probabilistic routing is one of the protocol that can be used in internet of things and the decision of the routing is based on the calculated probabilistic value. A primitive method to calculate these values is by chattering.the data packets are sending only once the traffic jam overhead is reduced. A greatly organized method is denote the previous history of packet sending and movement pattern, based on this we can choose which nodes can select a path to the destination.

E. Routing Protocol for Low Power and Lossy Networks (RPL)

This routing protocol is one of the protocol that can be deploy for internet of things which can be depend on IPv 6 and support routing with slight request by creating a powerful topology on the lossylink.The RPL enhances point to multipoint and multipoint to point communication simple and complex traffic models. The central part of the routing protocol for Low Power and Lossy Networks denoted by a Destination oriented Directed Acyclic Graph,which can be a directed acyclic graph with one root.so the node knows its parent but doesn't have communication about its related children. The RPL can be used in the term of internet of things in order to make a suitable performance on parameters set.

F. Adhoc On-Demand Multipath Distance Vector (AOMDV)

The AOMDV is one of the routing protocols that can be used for the concept of the Mobile Adhoc network(MANET) and that can be exploit in the term of (IOT) internet of things .This protocol was introduced in order to route with low overhead .Ad hoc On Demand Multipath Distance Vector calculates multiple loop and link paths .Each node keeps the list of its next hop based on the hop count.

G. Ad-hoc On-Demand Distance Vector (AODV)

AODV is a reactive routing protocol which is used in mobile ad hoc network and can be exploited in the term of the internet of things (IOT) .Ad-hoc On-Demand Distance

Vector (AODV) calculates a loop allowed lone path on request. A mobile node discovers and keeps a route to another node only when it requests to connect. One comment of AODV is that, the basis actually notices multiple ways through the route discovery process, it can select only the require path and through the remaing out .

VI. LITERATURE REVIEW

YicongTain et al . [7] The Designed of routing method which take function as routing destination not just nodes. (IOT) is a major concept and it's a new in IT field. However, The route designing part is a major important concept in the internet of things while the research of routing protocols of internet of things is still a empty.in this term, the growth is appropriate for the use in (IOT). Related with AOMDV for the in the internet of things, simulation results show that AOMDV-IOT reaches better performance in average end-to-end delay, packet loss and discovery frequency .

K´assioMachado et al ,[8] Enhanced for the internet of things a routing protocol depend on a routing by energy and link quality. The routing by energy and link quality (REL) chooses routes on the source of enhanced end to end link quality estimator devices. Moreover ,the routing by energy efficiency improved an event driven mechanism to deliver load balancing and avoid the early power depletion of the networks or nodes. The presentation of the estimates were approved using the simulation and testbed to demonstrate the effect and importance of routing by energy and link quality (REL) In a small and large scale.The internet of things (IOT) applications such as the smart home,smart city, smart parking ,healthcare and environmental monitoring are used the routing protocol together with load balance scheme based on energy and link qualiy. Furthermore ,it enhances an end to end route collection scheme based on cross layer information with a least overhead .Nodes can become power efficient by sending the residual power to their neighboring nodes with the help of a piggyback and on demand scheme.

Sang-Hyun Park et al, [9] Proposed the energy efficient probabilistic routing algorithm(EEPR) which is used to control the request packet sending process in order to decrease the packets loss and congestion of the network in the context of the AODV.A source node in the network has data packets to transfer forwards the route request packets to its one hop neighbour nodes.Each node in the typical AODV receives the a route request packet sends to all their one hop neighbour nodes,and the node which doesn't forward the route request packet all the time but count the sending probability by the proposed probability formula and choose stochastically wether to send or cancel it .The proposed protocol in this paper has longer lifetime of the network and deplete the remaining energy of each node when they compare it with the typical AODV protocol.

EhsanAhvar et al , [10] presented an energy –aware routing protocol (ERP) for query based applications in wirelss sensor networks,which gives a good trade off between traditional energy balancing and energy preserving objectives and upholds a soft real time packet delivery .this paper study the energy aware query based routing protocols and from the routing perspective they observed that the current destination initiated query based routing protocol can be considerably enhanced ,particularly if the aid for a better balance between the power saving and the power balancing objectives.

Reena Singh [11] proposed an energy efficient AODV routing protocol which is an enhancement in the existing AODV routing protocol. This modified protocol used to save the power in mobile devices and it has improved the route request and route reply handling process.EE-ADOV routing protocol is considering some level of power as minimal energy which should be exists in the node to be utilize as intermediate node .when the power of the node reaches to or below that level ,the node should not be considered as intermediate node .The major concept of this objective is that the route from the source to destination can be chose by keeping the power consumption as an important parameter,so the perfect path is available through the intermediate node having less energy power and source node has one more route as an alternative to forward ,then the second path should be opted by the source node.

Hua-Mei Xin,[12] led to the routing protocols mechanism that are existing in Mobile Ad hoc network in order to achieve a proper protocol scheme for internet of things .The routing protocols were equated with the throughput, routing overhead and end to end delay when exposed to variation in all number of nodes and the percentage of node .The AODV routing protocol is consider as the best performance routing protocol in the term of throughput .when the priory of the communication used for the future of the internet of things ,the Adoc On Demand Distance Vector should be accepted to further improvement.

NisheethKhanna [13] proposed an energy efficient path routing (EEPR) protocol, that reduces the variance in residual energies of nodes and thus increases the net-work lifetime of MANET. In addition, it is also proposed to include a link stability parameter while selecting the routing path to further improve the energy efficiency. Using a min-max formulation for highest residual energy path and link stability parameter, EEPR selects the path that is most energy efficient and with highest stability/reliability. The proposed algorithm aims at addressing the problem of improving the energy efficiency and thus maximizing the network lifetime of a MANET deployed in a typical military scenario. The proposed EEPR routing protocol selects a path based on max-min formulation for finding the ideal residual energy path for reducing the variance in energy consumption/residual energy of the nodes.

Chinyang Henry Tseng , [14] suggested Multipath load balance (MBL) routing algorithm which contains tow major designs layer design and load balance layer ,desings allocates nodes into various layers based on the node distance to the internet of things gateway. The nodes can have multiple next hop delivering internet of things data.The whole niebhoring layer nodes exchange overflow information including current load, utilized by load balance to evaluate future load of next hops.in this proposed routing protocol all nodes have the opportunity to select the neighbours with least load as the next hops and this can accomplish load balance and evade bottelnecks. Multipath load balance is proposed to supply a load balancing reliable ,and robust routing service for Internet of things applications.

AnamikaSharma ,[15] presented a protocol based on AODV to enhance the routing of AODV for IOT. This is modified AODV to adjust with the usage in internet of things. The mainl objective is to find out and create the communication between nodes and internet efficiently. The modified AODV routing protocol will find the most suitable link automatically, and record other links as back up.and the duration of the comparison in the performance with the traditional AODV shows better implementation.

AnkitaSaini et al ,[16] proposed a multipath routing protocol for the internet of things which adjusts to the basic requirments of the internet of things network. Presented work and internet communicating routing table (ICRT) is utilized which contains of routing information as well internet communicating nodes information ,there by removing need to preserve seprate table for internet communicating nodes information. They have analysied and estimated the performance of(MRPIOT) on the basis of parameters such as packet delivery ratio, energy consumption and throughput. This protocol compared with the traditional AOMDV for IOT against various parameters by varying the number of nodes and the comparison shows that better packet delivery ratio throughput and less energy consumption as compared to AOMDV protocol in IOT environment .

VII. CONCLUSION AND FUTURE WORK

The internet of things are becoming popular day by day in our modern life, trying to change the quality of life by interconnect many technologies, devices and applications. Generally ,the internet of things would allow for the automation in everything around us. This paper is to study about the mechanism of internet of things ,the routing protocol and challenges on the basis of energy efficiency routing protocols papers are analysed and Future work will be focus on Evaluating the impact of Energy Efficiency in speed and location information with different parameters set .We put forward a framework to appropriate for IOT and implement it to further improve the performance on the same.

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