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To Proposed a Novel Technique to Remove Effective Collision by Clock Synchronization in Wireless Sensor Network

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Abstract— In wireless communication system, group of nodes forms wireless sensor network (WSN). During communication these nodes makes a suitable path for transferring the information. Size of WSN depends on the type and quality of service, the service coverage area, and the scalability of the service. Data centric, hierarchical routing and location based routing protocols are used in the wireless communication. These routing protocols utilizes diverse amount of energies. The consumption of energy is the major concern in WSN. The energy must be quantized for computational purposes. Giving greater probability to nodes with more energy, to be taken as cluster head, helps in better distribution of energy and more reliable message transmission. Apart from communication, lot of energy is consumed in synchronizing the WSN. In general, WSN has no central controller. In this work initially the cluster heads are chosen by election algorithm for each cluster then diffusion based technique is applied to synchronize cluster head clock. Results shows the synchronized cluster head can reduce the energy consumption, packet loss while increase the throughput.

Keywords-- Cluster head, diffusion, RFID, diffusion based technique.

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I.   INTRODUCTION

Wireless Sensor Networks (WSN) comprised of many spatially distributed individual nodes which are interconnected to form a system that operates as one network and used to monitor physical and environment conditions [1]. A collaboration of large number of such sensor nodes is needed as it is not possible for a single node to cover large geographical areas. Sensor Networks perform two main operations - the data dissemination or spread of queries throughout the network and the data collection or gathering from individual sensor nodes and pass it on to sink. The nodes use wireless communication, mostly wireless radio, to connect with each other and also with base station [2]. The Collected data is rarely processed by the nodes due to memory and battery limitations; hence it is passed
on to remote device where it is analysed, processed upon or stored. The sensor nodes may differ in their physical size but the cost of these depends upon the
complexity of each node.

A.   Challenges and Issues in WSN

i.   *Service type:* The service type as observed by a communication network that involves transferring bits from one position to other. In WSN, transferring of bits is not the genuine goal but just a means to an end.

ii.   *Quality of service:* Quality of service usually referred as the excellence seen by the client/ application however in the networking community. In other words, quality of service [3] is defined as a

measure of the serviceability excellence that the system serves to the application/clients. It is defined as an arrangement of serviceability necessities to be seen when transmitting a stream of packet from the source to its destination. In this situation, quality of service prescribes an assurance by the Internet to supply an arrangement of mensurable service aspects to the end-to-end clients/applications as far as delay, jitter, available bandwidth and packet loss.

iii.   *Fault tolerance:* Due to any factor which may be physical damage to the node or dead battery, a node[4] may run out of service .This leads to a broken link. Overall functioning of the network should not be affected by this. One way to overcome such a glitch is by deploying redundant nodes .

iv.   *Scalability:* Number of nodes in action is mostly application dependent. Since such number varies from hundreds and thousands of nodes per WSN. The utilized structures and conventions must have the capacity to scale these numbers [4].

v.   *Wide range of densities:* Number of nodes per unit area is defined as node density which is a variable quantity per WSN or within a network. Application requirements set the node density. Even for a given application, node density may vary due to change in the user's position. Also node density is not homogeneous through put the network [5], density can vary over time and space. Network should be flexible enough to adapt to these variations.

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B. *Routing Protocols*

There are vast numbers of routing protocols available for WSNs. Routing is the process of finding best path through which data can be sent from source to destination which is mainly base station. When individual networks are connected together to create an internetwork or large network, connecting devices routes the packets to final destinations and these connecting devices are known as routers or gateways. Several routing [6] protocols can be broadly classified into three categories; namely data-centric routing, hierarchical routing and location-based routing .

 1) *Data Centric Routing:* Data Centric routing protocol differs from traditional attack**.** In this   protocol, when the data is send from source sensors to the sink, intermediary sensors can execute some kind of accumulation on the information arising from diverse source sensors and send the gathered information towards the sink.

a) Direct Diffusion: It is used for sensor inquiry spread and preparing. It can meet the primary necessities of WSN like vitality effectiveness, versatility and so forth. A detecting task can be characterized by an attribute-value set list. At the start of the procedure, the sink   specifies a less information rate for drawing nearer events. Hereafter, the sink can reinforce one of the sensors to transmit the events with a higher information rate by resending the first message with a little interim.

2) Hierarchical Routing: In this approach clustered layers are created by breaching the network [6]. Data moves from a lower layer of cluster to an upper one. All the nodes are arranged into clusters which have their heads within it which has the routing responsibility to other CHs or BSs from the cluster.

3) Location Based Routing: In this protocol, nodes are identified by the method of their area. Sensor node area data is required by routing protocol to quantify the distance between two specific nodes to calculate utilization of energy.

II.   RFID PROTOCOL

RFID (Radio Frequency Identification) is a without contact programmed recognizable proof procedure that depends on radio frequency. RFID is of two sorts [7] as indicated by the power source: active RFID and passive RFID.

A. *Active RFID:* Active RFID system uses an internal battery to constantly charge the tag and its Radio Frequency message micro-circuitry. It permits extremely low-level signals to be acknowledged by the tag [8]. The tag can create high-level signals back to the reader, induced from its inward power cause.

B. *Passive RFID:* Passive RFID relies on Radio Frequency energy which is exchanged from the reader to the tag so that it can charge the tag. Passive RFID either reflects energy from the reader or assimilates and temporarily stores a next to no measure of energy from the reader's signal to deliver its own quick reaction.[8].

Active RFID is less profitable than inactive RFID as far as its label, cost, size and battery administration yet more favourable as far as detecting nature, detecting rate and detecting separation. RFID is involved to store the physical data and can be detected for a long stretch to help the part of the framework.

Radio module is used by an active RFID tag to convey the reserved physical data to the reader. It imparts point-to-multipoint (P2MP) inter-communication structure in which the reader orders the tags. The reader controls the energy which is absorbed by the radio module to make the tag works in the active and sleep periods to minimize the utilization of energy of the tag. The reader sends a gathering order to various tags which are going to pass on the ID to the reader with conflict. The active period is divided into two periods first one is the tag identification period and other is the data collection period. The ID period is called contention period [8]. A reader can transmits a summon to different tags which passes on ID to the reader with conflict. In data collection period, the reader assembles the information on the tags that can be detected from the tag ID collection period utilizing their IDs, by means of the point-to-point (P2P) strategy. Amid the procedure, the sleep command switch off the radio module of the tag from which the information have been accumulated. This procedure proceeds until the majority of the tags inside its correspondence range are assembled. Table 1- shows the technical difference between Active and Passive technologies as follows:

TABLE I
TECHNICAL DIFFERENCE BETWEEN ACTIVE RFID AND PASSIVE RFID

	Active RFID	Passive RFID
Tag Power Source	Internal to Tag	Energy transferred from the reader via RF
Availability of Tag Power	Continuous	Only within field of reader
Tag Battery	Yes	No
Available Signal Strength from Tag to Reader	High	Low
Required Signal Strength from Reader to Tag	Low	High

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III. NETWORK TIME PROTOCOL AND CLOCK SYNCHRONIZATION

Time synchronization plays an important role in energy saving and node management. Network Time Protocol (NTP) is a protocol based upon switching of packets and provides clock synchronization between computer systems. Performance of NTP is tunable based on application and environmental loading also. It is a highly robust internet protocol provides some interfaces as well. NTP [9] is superimposed on top of TCP/IP to synchronize between the scattered clocks over long time periods. In clock synchronization process all the nodes and the cluster head within a network synchronized at the same time slot. Clock synchronization has two techniques:

A. *Time-lay synchronization*

B. *Diffusion based synchronization*

In time-lay synchronization, all the nodes of the network set their clock according to third party clock, while in diffusion based technique, any two nodes set their clock accordingly when communication with each other.

IV. RELATED WORK

Energy Efficient Sleep Awake Aware (EESAA) [10] routing protocol for homogeneous systems while keeping the benefits of disseminated clustering as well as introduced by Shah et al. The two nodes having a place with same application and closest to each other are assembled into a pair. GPS (Global Positioning System) has been sent to gather the area of all nodes. The matched nodes switches amongst "Awake" and "Sleep" mode in turns. The heads of the cluster were chosen by distributed algorithm. In this way the utilization of energy was minimized using EESAA while streamlining security of network a great deal more than LEACH, SEP and DEEC.

Joint performance analysis of four cluster based hierarchical routing protocols; namely LEACH, TEEN, SEP and DEEC [11] introduced by Latif et al.. Comparison was done by simulating these in MATLAB. Performance matrices taken were number of live nodes, number of asleep nodes and packets sent to base station. Sensor nodes can sustain their energy only for certain number of rounds. Network lifetime increased by making nodes to last for more number of rounds. Clustering process was explained in form of three states; namely advertisement state, setup state and steady state. Finally after careful examination of results obtained, author concluded that DEEC exceeds among other protocols by giving feasible ideal arrangements against imperatives of demonstrated framework.

In this paper [12] discussed that remote sensor systems turning out to be imperative for creating of energy effective foundation. They found the base partition separation between cluster heads in a group based sensor system, drawing out network lifetime by bringing down the energy utilization. They performed simulation to decide the amount of vitality is devoured by sensor system in isolating the cluster heads. They likewise talked about the impact of energy utilization for a given least partition separation between cluster heads They demonstrated that remote sensor system could better performed when they presenting a base division separation between cluster heads. It is verified by comparing the quantity of message was gotten by the base station.

Centralized Energy Efficient Clustering (CCEC) [13] routing protocol designed by Aslam. This protocol had been implemented for three levels of heterogeneity. It tried to address the drawbacks of SEP, E-SEP and DEEC. In these protocols there was no provision for uniform geographical dissemination of high-energy nodes which are most likely to assume the role of cluster heads. Also the distributed clustering algorithm introduced the additional computational overhead. In CEEC, base station was fixed with additional responsibility of selecting optimum number of cluster heads. The network topology was segmented into three local regions for three types of nodes present with base station on top. Normal nodes were present nearest to the base station while super nodes are placed at the far end. Guaranteed number of channels increased the throughput of CEEC.

Energy efficiency through multipath routing scheme [14] is suggested by Boulfekhar and Benmohammed. Rather than directing every one of the information through a solitary minimal effort steering way, EERP (Energy Efficient data Routing Protocol) distributes the traffic across various paths selected on the bases of cost function and node energy. All nodes maintains neighbouring information table to look up for network load delays some particular nodes to run out of energy and produce partition in the network. This enhances network stability and lifetime.

In this paper [15] they examined that in remote sensor systems to enhance the life time of the sensor system, for the exchange of information, the way is picked in a manner that the energy utilization is minimized in that way. To bolster high adaptability and better information collection, sensor nodes are regularly organized into clusters. Clusters constitute progressive remote sensor system, the sensor nodes uses their restricted assets in a sufficient way and in this manner expand system lifetime.

Energy efficient active power executive method [16] proposed by Rupali. Network as a whole expends energy in communication. Another way for power consumption was at each node level itself. It can decrease power consumed by apiece sensor node by shutting down some components of sensors according to algorithm which enhances network lifetime and saves other resources.

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V.   PROPOSED METHODOLOGY

The proposed methodology is shown in fig 1 by the flow chart. The procedure begins by conveying the sensor system with limited sensor nodes. All the sensor hubs are organized to a structure cluster as per the client. Every group is given a cluster head and Cluster heads are picked by decision algorithm. A node inside a group which has more assets and vitality is taken as a cluster head. Once the cluster heads are identified, the clock synchronization takes place. In this work Diffusion based clock synchronization is employed. Every cluster hub sends clock time to the group head. After that cluster head figure out average clock time and set their clock as indicated by average clock.

Presently cluster head sends its clock time to alternate hubs of the group. Hubs set their clock as per the cluster head hub. All the cluster heads works in the comparable conduct. Presently to synchronize with the system, all the cluster head ascertain their average time. As indicated by the outcome, all the group head set their time. Different nodes have different time slot for communication. Adhoc-on-demand distance vector routing protocol is used for shortest path between source and destination nodes. As every node within a cluster has a specific time to communicate with their cluster head and cluster heads too in a network, there is no chance of interference and data loss. The clock synchronization established till the communication end.
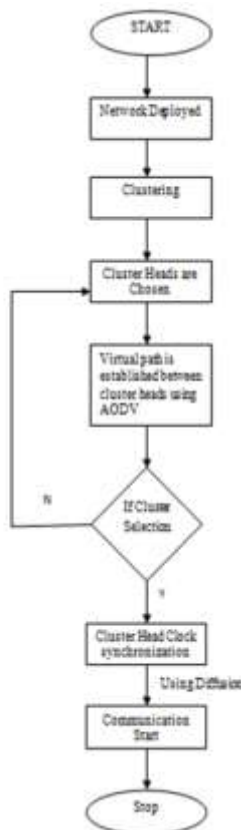

Fig.1- Flowchart Of Proposed Methodology

VI.   RESULTS AND DISCUSSION

The whole scenario is implemented on Network Simulator2 (NS2). It is a simulation platform and discrete event simulator. Network simulator depends on C++ and an object oriented tool command language.

A. *Simulation Parameters:* The following parameters have been taken as input while working on simulator to create a virtual environment. These parameters are selected by considering the previous work [17] as reference. The similar parameter makes the condition suitable to compare the obtained result with the existing.

TABLE II
SIMULATION PARAMETERS

No. Item	Item Description Parameter	Item Description Value
1	Simulation Area	800X800
2	Channel Type	Wireless Channel
3	Antenna Type	Omni Antenna
4	Interface Queue Type	Drop tail/ Priqueue
5	No. of nodes	20
6	MAC Type	IEEE 802.11
7	Link Layer Type	LL
8	Traffic Source	CBR
9	Routing Protocol	AODV
10	No. of Cluster	4

B. *Simulation Results:* The WSN setup and clock synchronization process with chosed simulation parameters have been executed. The result got from the proposed procedure has been contrasted with the past work packet loss and throughput
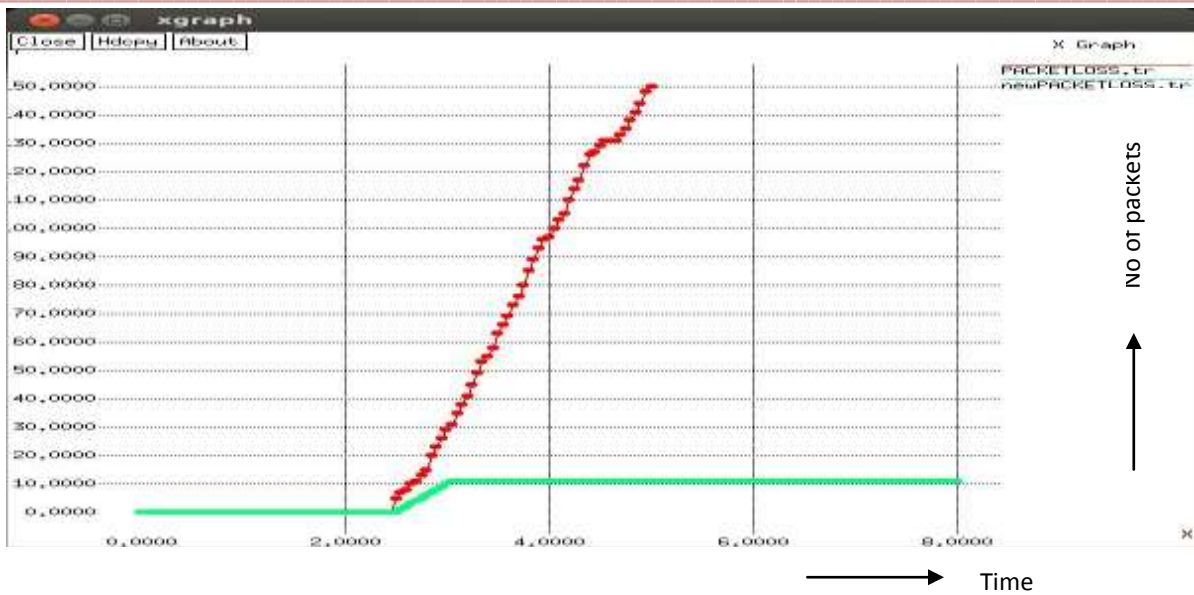.

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Fig.2- Packet Loss Graph

The graph appeared in fig. 2 represents the packet loss of existing and proposed method. The green and red line shows the proposed and existing method individually. The time is represented by x-axis and number of packets is represented by y-axis. In the current procedure the clock of the cluster heads are not synchronized that is the reason the packet loss is more in the current system. In any case, in the proposed system, the packet loss is diminished from 50 to 10 packets in light of the synchronized cluster heads with the diffusion technique.
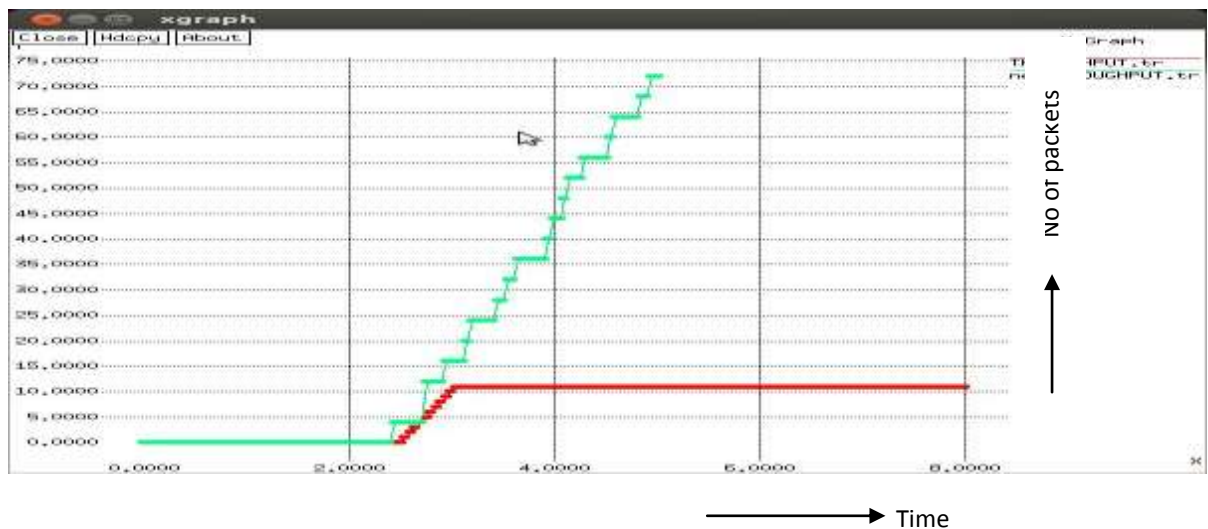
Fig.3- Throughput Graph

Fig.3 represents throughput of the current and proposed method. The green and red line shows the throughput of proposed and current method individually. The time is shown by x-axis and no. of packets is shown by y-axis. The productivity of the system is expanded with the clock synchronization. Throughput is conversely corresponding to the packet loss. From the fig 2 and 3, it is seen that communication through synchronized WSN can diminished packet loss altogether and the throughput of the system is upgraded from 11 to 72 packets in the proposed procedure in light of the fact that the loss of packet in the system is diminished.

TABLE III
MATRICES FOR PERFORMANCE ANALYSIS

Parameter	Old Scenario	New Scenario
PACKET LOSS	50 packets	10 packets
THROUGHPUT	11 packets	72 packets

VII. CONCLUSION

Energy effectiveness is one of the real difficulties in outlining the routing protocols for WSNs because of alarm energy

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assets of sensors. The utilization of energy of the sensors is controlled by information transmission and gathering. The lossless communication can be conceivable through synchronized system.

In this paper area based clustering algorithm has been connected on the nodes inside the WSN. Cluster heads are picked utilizing bully or Election Algorithm. The node with the most astounding vitality will be chosen as cluster head. A proposed novel method based upon diffusion plan has been applied to synchronize the nodes. The responsive AODV calculation is presently applied over synchronized system to choose the shortest path. Along these lines, the issue of clock synchronization which corrupts the execution of the system regarding energy, packet loss and throughput has been disposed of. RFID is better protocol since it has 3 modes; active mode, sleep mode and ready mode. It has RFID sort sensor which has fast reaction at action consequently reaction time and energy utilization diminished. Energy utilization is decreased from 24 joules to 12 joules, packet loss is lessened from 50 to10 packets and throughput is expanded from 11 to72 packets.

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