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Minimizing The Energy Consumption In Wireless Sensor Networks By Differentiated Data Aggregation Routing

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ABSTRACT

In the current WSN activity process, there are two significant issues such as transmission in the variance of data and energy for the system's utilization, which truly influences the unwavering quality of the WSN. The collection of information is a broadly embraced strategy to adequately tune the level of information during transmission as well as to increase the durability of remote sensor systems. A Differentiated Data Aggregation Routing (DDAR) technique was implemented here to minimize the utilization of energy and assurance for postponement for controlling according to QoS necessity limitation. An essential commitment of DDAR was: (a) The DDAR conspire delivers the information with various QoS prerequisite courses to the sink along with different ways. (b) Considering DDAR conspire, the boosted DDAR technique was implemented additionally to accelerate execution by completely using energy which was remaining on hubs making a long way origin from the sink. The DDAR technique is a novel method to route the data. In this structure, every hub will design to receive much of the parameters to fulfill a certain QoS necessity. At the point when a hub performs the collection, it looks through an aggregator under which administration most intently coordinates its QoS necessity for the sequent jump. Almost firmly coordinating alludes to the hubs contains the littlest contrast of QoS necessity with the transmitter. DDAR technique maintains the level of energy utilization and complex stockpiling which ensure efficiency compared with past methodologies. Subsequently, the DDAR technique understands the separated information accumulation directing in the genuine sense and can altogether diminish the utilization of energy while guaranteeing that information transmission meets administration prerequisite.

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1. INTRODUCTION

Wireless Sensor Network's routing plans for coordinating hubs employing one or many jump ways. The procedures are set up to advance packets of information from sensor hubs to the sink. Building up a unique way to report each information brings about expanding vitality utilization in WSN. Thus, collection of information is utilized to join information clusters and therefore decrease the transmission number. Which lessens the directing issue by dispensing with excess and futile information. Here are 2 structures for information accumulation directing in WSN: Versatile Operator and Customer/Server [1].

A Wireless Sensor Network (WSN) comprises of little and modest registering gadgets that are dissipated to gather and report surrounding information. The system hubs are normally static and convey through allowed remote channels that are restricted (as far as correspondence extend), inconsistent and helpless against natural clamors, signal reflections, remote impedances and additionally physical impediments. The fundamental goal of the WSN foundation is to give ease in encompassing information assortment administrations. The hubs, as a rule, are little and modest with constrained vitality, calculation, correspondence and capacity assets that can perform just a lot of fundamental calculation and correspondence undertakings. They measure encompassing information and transmit the outcome to the shopper passage (sink) as it has less asset confinement. WSN design has commonly named either level or progressive. The level system is framed by the hubs which are normally arbitrarily dispersed in the territory, though the various level was configured by the clusters or the gatherings of hubs.

The main advantage of WSN was it able to execute at anyplace neither requirements for a particular correspondence foundation. It enables a WSN to be conveyed as an option to the non-existent foundation (for cost adequacy) or if the current framework isn't suitable to utilize. Attributable to this, WSN innovation is utilized in various applications like training, authentication, transportation and wellbeing. For instance, on account of instruction, this innovation can be utilized to make a protected and simple to-utilize research center in which the understudies experience logical ideas in subtleties [2].

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A crucial test for the structure of WSN's is to amplify durability, specifically if it was constrained as well as not enough in the delivery of energy. For expanding the lifetime of a system, control the board by consumption of energy methods at all layers makes it efficient. This presents answers for the information assembling and directing issues in WSNs. WSN was remotely organized modules where the hubs are formed with sensors, to compute and convey data from the environmental area to a Base-Station (BS) presented at distance. Upcoming WSNs was focussed on agitating upkeep and inadequacy open-minded stage for social affairs and getting ready information in grouped conditions. A noteworthy specific test for WSNs, in any case, lies in the center point imperativeness necessity and its compelled enrolling resources, which may speak to a key breaking point on the framework lifetime. Thus, innovative procedures to get rid of essentialness inefficient perspectives that would some way truncate the lifetime of the framework are particularly required.

Because of the relationship available on collecting data in the sensor's, thus normal that correspondence moves toward considering this connection, e.g., information conglomeration and in-network preparing, will beat customary methodologies. The primary thought of the information collection and in-arrange preparing methods for consolidating the information landing from various sources (sensor hubs) at certain accumulation focuses (or essentially aggregators) in transit, dispose of redundancies by performing basic handling focus and limit the aggregate sum of information transmission before sending information to the outer BS. Expelling redundancies brings about transmitting less number of bits and thus lessens the utilization of energy and builds the sensor hubs' lifetimes. Different techniques about overall design lead to upgrade the system throughput and progress in energy consumption which conceivable utilizing information collection and in-organize preparing in WSNs.

WSN routing is accountable for interconnecting sensor hubs utilizing either single or multi-jump joins. It incorporates the method of course disclosure, foundation and upkeep. The reason for WSN routing to direct the packets contain information from occasion areas to the sink. Previously routing the bulk of information through remote correspondence from the source node to the sink expands resource utilization and therefore decreases the system lifetime. This implies the sensor hubs would devour a lot of system energy, on the off chance that they have to advance each detected information test to the sink.Information gathering is a step to accumulate a bundle

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of information together. This can take out unimportant/repetitive information and diminish the number/size of transmissions [8]. Henceforth, an information collection strategy can diminish the utilization of energy to a particular level in a WSN. This system consolidates the information bundles utilizing a conglomeration work (e.g Rank, Sum, Median, Standard Deviation, Average, Variance, Count, Minimum and maximum,) into a solitary one to transmit. This brings about decreases of transmissions and therefore diminishing the network costs, limit transfer, organize, utilization of energy and system delay in WSN routing.

Delay is an essential criterion for modern sensor systems. The investigations in vitality proficiency centers around are how to minimize the utilization of energy for increasing a lifetime of the network. Due to improvement in the utilization of energy, information accumulation is a compelling technique. The process for transmitting the information, the collection of information might be accumulated by segments of littler volume. In this way, vitality utilization can be decreased. This is arranged as an accumulation routing issue [4]. In this situation, separated information conglomeration routing is an insightful alternative. The primary thought is to set diverse predominant parameters for various QoS prerequisites. Because of the reason for meeting distinctive QoS prerequisites, the utilization of energy and the transmission delay is decreased hence the efficiency gets increased. Be that as it may, the extraordinary idea of information total routing makes the plan hard to be completely executed. Every hub in the system gets ready on various sides and cut off it's time for QoS necessities. At the point when the information in a hub fulfills some total condition, all information parcels in the line ought to be accumulated and moved. In any case, this methodology makes the information with limit QoS prerequisite is hard to keep legitimate and gives the information with QoS necessity a pointless and unnecessary help ensure [9]. Additionally, on the off chance that we utilize the system which unique the information with relating administration prerequisite is gathered when necessity is fulfilled, the information stockpiling structure is increasingly unpredictable and the utilization of energy in transmission gets increment. In outline, the technique just setting various cutoff times and edge for comparing QoS necessities has a constrained streamlining execution on DiffServ(Different server) systems, proposing an effective separated administration procedure in WSNs is a difficult criterion. Due to these issues, a DDAR conspire was developed to diminish the utilization of energy and guarantee that a wide range of information meets their

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administration necessities. Remarkable highlights in the developed system were detailed as pursues:

This proposed conspire was a unique information collection directing structure. In this structure, every hub designs just one lot of parameters to fulfill a certain QoS prerequisite. At the point when a hub performs conglomeration, it looks through an aggregator whose administration most intently coordinates its QoS prerequisite for the next bounce. Almost firmly coordinating alludes to the hubs which have the littlest contrast of QoS prerequisite with the sender. DDAR improves the utilization of energy, stockpilingcomplex and smart assistance compared with past methodologies. Consequently, the DDAR technique understands the separated information accumulation directing in the genuine sense and can fundamentally diminish vitality utilization while guaranteeing that information transmission of information bundles meets administration prerequisites. In light of DDAR conspire, it proposes an enhanced DDAR plan to decrease postpone as well as to boost vitality proficiency by using the lingering vitality in the hubs a long way from the sink. Whichever directing procedure can be embraced, the information volume in a hub transfers in the limit from the expansion of data's to the sink. The proposed way represents that the consumption of energy of the hubs close to the sink is better than the hubs a long way from the sink, there is the consumption of energy maintained in the hubs when the system passes on. Hence the proposed work, improved DDAR upgrades the system by expanding the recurrence of conglomeration.

2. RELATED WORK

The conglomeration is that the global strategy for events in social and data for routing through a multihop organize, process data at transitional hubs to diminish asset utilization (in unequivocal vitality) along these lines it also expands system period. There are two methodologies for in-organize conglomeration: with size decrease and keeping in mind that not estimate decrease. In-arrange conglomeration with size decrease alludes to the strategy for blending and weights the data bundles got by a hub from its neighbors to downsize the parcel length to be transmitted or sent towards the sink. In-arrange collection while not estimate decrease alludes to the strategy blending data parcels got from totally various neighbors into one data bundle be that as it may while not process the value of data.

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Pittsburgh University Scientists proposed an improved synchronization subject is termed as TiNA (Temporal Coherency-Aware in-Network Aggregation). The primary objective of their system is to downsize an information amount that spread based on the system as well as expand its precision of concurring outcomes in case certain sensing elements while dropped its communication during processing with the system [6].

Inside the tree-based approach, it performs accumulation by developing the tree with a collection of information, leads to spread the information on the tree, stock-still at supply and sink hubs square measure organized as leaves. Every hub consolidates a hub contains a parent to advance collected information. Information Stream begins in surrenders hubs over to the sink and this the accumulation is done by parent hubs. As a rule, tree-based conventions manufacture a customary most limited way directing trees. for instance, the Shortest Path Tree (SPT) rule utilizes an extremely simple methodology to make a directing tree in an exceedingly disseminated manner [2].

The researcher in [3] talks about different information conglomeration techniques dependent on routing conventions also calculation and the exhibition measures for whole information in WSN's. They examine the different sorts of hubs and the inclusion of every hub in the entire procedure of information collection. They additionally examine different benefits and faults of information collection in WSN. In the paper, they consider different parameters, for example, vitality productivity, inertness, information precision as a presentation proportion of information accumulation.

Authors in[4] develop a strategy called link Aware Data Aggregation Mechanism (LDAM), an information collection calculation dependent on an inactive clustering system that focuses both on the proficient CH and GW (GateWay) determination computation and changed directing the data control during the information total procedure. Uninvolved clustering focuses on the connection condition and condition of the hubs.

Researchers in [5] present a direct dispersed calculation for totaling information and uniformly expand vitality and recreated it for various situations utilizing the ns2 organize test system. The proposed calculation is disseminated, there is no sensor synchronization and there is nothing of presence by worldwide information on the remote sensor organize. The

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nonappearance of worldwide intelligence varies this proposition with various techniques such as PEGASIS was a noteworthy commitment.

R. Jayalakshmiet al. [6] proposes a calculation, suggests a legitimate partition of sensors that has some kind of sensors shapes a virtual way to accumulate. After dealing with sensor clusters, it inspects the nodes among sensor hubs of each gathering. The method associates all sensors by picking the briefest separation to go starting with one hub then onto the next. It produces a chart to incorporate all hubs without shaping cyclic gathering among hubs. Information collection is done at the chart hubs to abstain from arriving at the same hub once more.

3. OVERVIEW OF DATA AGGREGATION IN WSN

WSN comprises the enormous number of sensor hubs generally set up in the disengaged and unfriendly regions that are restricted in detecting, calculation and correspondence capacities. Because of resource-constrained sensor hubs, there is a need to diminish the measure of information correspondence. Information collection is the procedure where data is assembled and communicated in a rundown structure to diminish the measure of information correspondence in the system. To improve vitality proficiency of sensor organize, Data accumulation conventions intend to consolidate and summarize the information bundles of a few sensor gestures and characterize and channel information from the undermined hubs [8].

Information conglomeration can isolate into two kinds 1) Reactive and 2) Proactive. Responsive conventions respond to explicit inquiries question by the hub in the system. The appropriate responses are returned to the guarantor of the question. Proactive conventions consistently give the estimation of the various total to a few or all hubs in the system, to pursue sensibly speedy changes in the system topology or the worth being comprehensive. Information accumulation limits the number of information transmissions, so it improves the data transfer capacity and utilization of energy in the system. Again, the collection of information brings about change in sensor information and its moving errand to give information confirmation along with information conglomeration. The issue like clashes, data collection and security conventions must be intended to perform better information total without giving up security.

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The sensing information and security are basic for remote sensor systems. In existing for secure information conventions the information aggregators scramble each message then the information was encoded before sending it. While these information accumulation conventions ensure information uprightness, improve transmission capacity and vitality use of the system, likewise adversely influence other execution measurements like postponement and information secrecy. Recently, a few conventions are proposed with strong against attacks and classification, respectability. In WSNs, a lot of sensor hubs accumulate application explicit data from the surroundings data is moved to a local base station. Accumulated data are handled, broke down and utilized by the application in the Base Station [9].

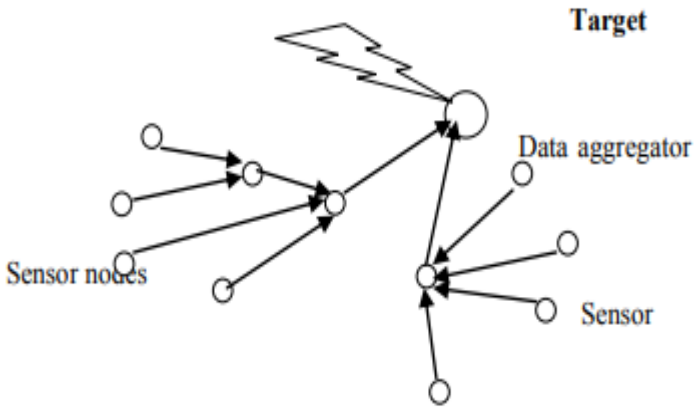

Figure No: 1 Data Aggregation

The fundamental objective of information accumulation is to develop the system life range by diminishing the asset usage of sensor hubs. There are two sorts of information collection 1) Address Centric (AC), the question is steered to a particular location, or a given sensor dependent on the location determined in the inquiry. 2) Data-Centric(DC), in light of the condition determined in the inquiry, all sensors fulfilling that condition need to answer and along these lines, the question is communicated to every one of the hubs in the system. It is depicted in Figure No.1.

4. EXISTING SYSTEM

4.1 AGGREGATION TREE

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Here the whole set of information is progressively transferred from every hub to its parent for in-arrange information total. The goal is to limit asset utilization and expand the information assortment rate. The tree is shaped by utilizing source hubs that report fascinating information to the sink. TAG (a Tiny AGgregation administration for specially appointed sensor systems) shapes a foundation like a tree for gathering as well as joining surrounding information. Toward the start, a sink transmits level disclosure data to relegate a level name to arrange hubs. Every hub expands its level an incentive by one and afterward advances the message to the following jump if the message is obtained. This is persistently performed until all hubs get a level worth. At that point, the hubs forward information bundles if they recognize an accessible way to their upper-level hubs. This technique is rehashed until the sink catches the totaled outcome. TiNA uses a comparable system for building up a tree framework wherein information total is performed. TiNA contrasts from TAG as it uses fleeting coherency resistance. Under TiNA, the source hubs transmit information esteems on the off chance that they contrast from the previous information reports. By this, the "tct" parameter is added to the questions to show the buyer inclination resistance degree. By this, an information test is sent if it varies with the last worth more prominent than "tct". As the source hubs don't transmit all the deliberate information, TiNA decreases the system vitality utilization. This is additionally upheld by the exact outcomes exhibited [9].

4.2 CLUSTERING

The system is classified into a lot of groups named cluster utilizing grouping method. There are two plans to frame the cluster: Address-Driven and Information-Driven. By this, the hubs that are comparative in area or correspondence qualities are gathered as a group. The hubs that live in a group are named Cluster Members (CMs). Among all CMs, unique or different hubs remain in the obligation of dealing with the group. They are called Cluster Heads (CHs). CH's generally gather and join intra-cluster information tests. Low-Energy Adaptive Clustering Hierarchy (LEACH) is a location-driven directing calculation that supports information conglomeration. The filter has two stages: arrangement and consistent state. The arrangement stage shapes the cluster, though the unfaltering state advances organize traffic to sink. Drain uses a conveyed arbitrary calculation to choose CHs. This is occasionally performed and drives each CH to remain in the obligation for a specific round dependent on a worth (P). This implies a CH

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cannot get a similar job up to P next rounds. TDMA (Time Division Multiple Access) is used by source hubs to gather and report the system traffic and stay away from the intra-cluster crash. In advance, CDMA (Code Division Multiple Access) is utilized by CHs to advance the totaled outcome to the sink and stay away from the between-group impedance. Sending the system traffic in unicast (rather than multicast) lessens the utilization of energy in LEACH. CLUstered Diffusion with Dynamic data Aggregation protocol (CLUDDA) diffuses the sink inquiries into a clustered system in which the CHs are responsible for performing in-network information accumulation. The questions incorporate information assortment data, for example, information type and collection work. Each CH that meets the prerequisites gathers and totals intra-cluster information tests and afterward advances the outcome to the sink. CLUDDA is an information-driven convention and enables the information shopper to halfway gather and total information tests from every area of the system in which information is alluring. It diminishes vitality utilization as information conglomeration was executed through a specific arrangement of Cluster head (rather than each Cluster head) which matches the intrigue bundle prerequisites [7].

5. PROPOSED SYSTEM

5.1 DIFFERENTIATED DATA AGGREGATION ROUTING (DDAR)

The aggregator’s able to transmit lesser data blocks gotten from the sink to the nearest sink aggregators. Information transmission and collection was essential utilization techniques for energy. In this model, every one of the aggregators is homogenous in vitality. By upgrading information sending recurrence by removed hubs, a power alias productivity of energy was enhanced with the durability neither widely break down.

The administration prerequisite for information parcels produced by every fixed sensor, the administration necessity of information can be straightforwardly coordinate to the sensor. In DDAR, aggregators decide their administration tag as per the number of administration prerequisites of the close by sensors. The estimation of N (aggregation threshold) and T (aggregation deadline time) is determined dependent on that tag. At that point, the aggregator was chosen by the sensors as its information bundles' goal. In the meantime, every aggregator sets up a next-bounce course as per the tag. DDAR can be communicated as pursues:

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• The tag of administration was authenticated by the Aggregators.

• The N and T were arranged by Aggregators.

• The Sensors itself decides it's goal for own information.

• The aggregator pick by the aggregator itself with a similar assistance tag for the next jump.

• Labels of Service turn.

In Figure No.2, α aggregator communicates with a and b sensors. By prerequisite of these sensors is level 2 and the tag of α is set as 2. The sensors in aggregator β's information assortment go need level 1 help, β's tag is set as 1.

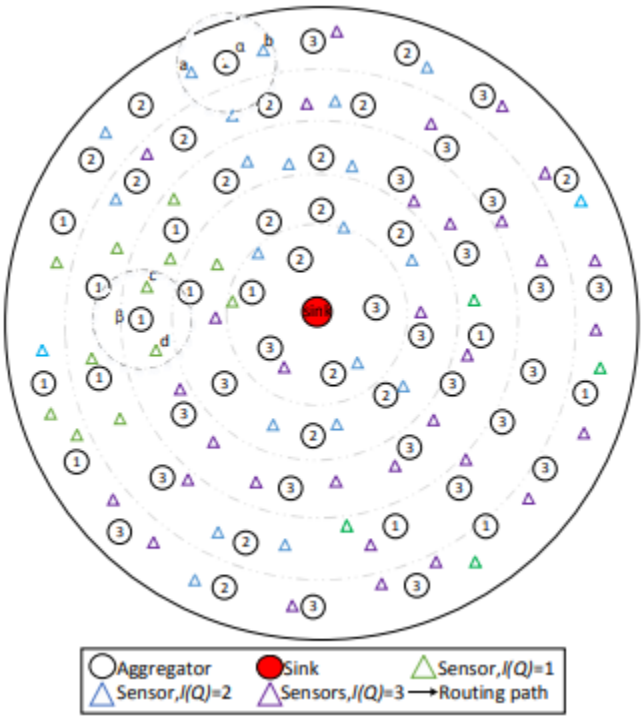

Figure No: 2 Sample Method in DDAR

The parameters which overwhelm accumulation are total clock and collection edge, the normal conglomeration delay directly increments as the total clock or the total limit increments yet is soaked at adequately enormous estimations of the total clock or the total edge. After the ID of administration tag, N and T are determined [10]. It plans an equation for aggregators to design

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N and T as indicated by the tag, guaranteeing that the information administration ensures rates are reasonable for correlation. The aggregators without tag don't arrange N and T until they have a tag. The design equation of N and T is as per the following (the method of T is the same as that of N).

$$N^i = 0.5 * v(Q^i) * \frac{1}{\eta} * P_\alpha * \lambda^{0.5} \quad \textbf{(1)}$$

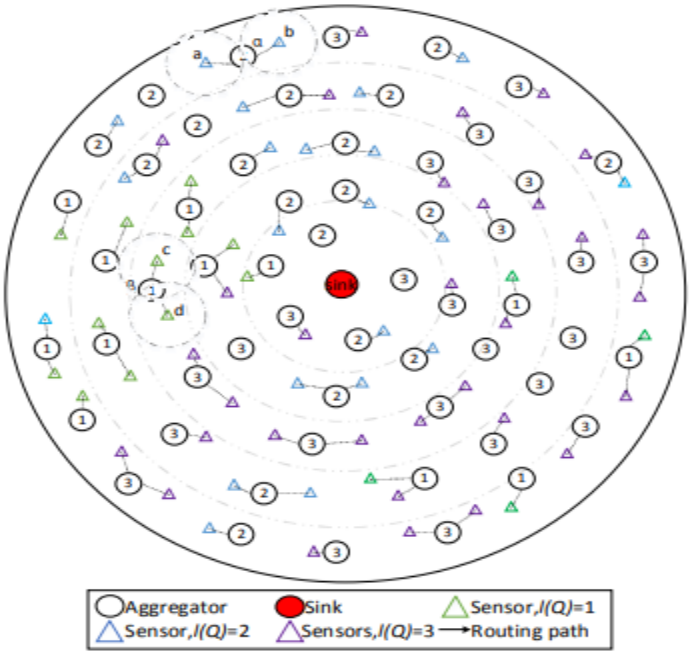

Figure No: 3 One Level DDAR

In light of sensors' constrained power, detected information should be transmitted to the sink through aggregators. In this stage Figure No.3, sensors pick the aggregators which their information comes to. After the aggregators decide their administration tag, every sensor communicates to all-encompassing aggregators in sensors' information transmission range to ask about their administration labels. The necessity of coordinating aggregator with the briefest separation is considered as the goal of the sensor's information transmission. Assuming none, the sensor from terrible to choose an aggregator with better assistance as its information's goal. On the off chance that there is no hub with superior assistance, the sensor from strong to weak chooses an aggregator with more terrible help.

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Sensors look through an aggregator whose administration tag is equivalent to the degree of the sensor's administration necessities. If no aggregator is owning the relating administration tag, then the sensor looks through an aggregator that has superior assistance from awful to great. If there is no aggregator with no comparing administration or better, the sensor begins to discover an aggregator with more awful assistance from strong to weak.

The quantity of the aggregators in the system is set as N, the time that the sensor communicates and gets the message is O(1). At that point, the sensor chooses an aggregator with the comparing tag. The overhead of this progression is O(N). On the off chance that there is no such an aggregator, the sensor would experience the labels twice till all the things to consider. In this way, the time unpredictability of a sensor chooses an aggregator is as Equation:

$$O(1) + O(N) + O(N) + O(N) = O(N) \quad \textbf{(2)}$$

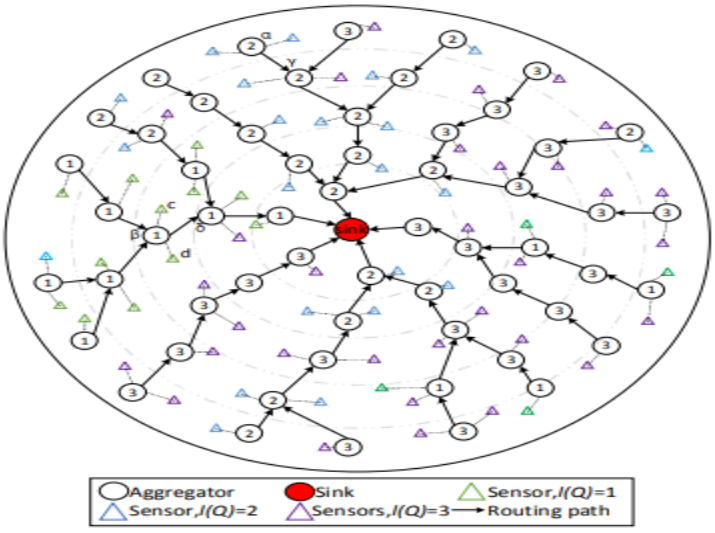

Figure No: 4 Next Level DDAR

While sensors pick their information transmission aggregators, aggregators issue administration label inquiries to the encompassing aggregators in the upper layer (closer to the sink) to decide the following jump course. The applicant aggregators with no tag are educated to set the label when no aggregator has a similar tag. At that point, that hub set N and T utilizing Equation. If there is still no aggregator with a similar tag, the aggregator would from terrible to great select an aggregator with superior assistance. On the off chance that there is no aggregator

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with superior assistance, the aggregator chooses a hub with a more terrible help from great to awful. On the off chance that the sink is in the foreordained range, the aggregator chooses the sink as the next bounce. The jump is spoken to in Figure No.4.

Aggregator looks through an aggregator whose administration tag is equivalent to the aggregator's administration tag. The aggregator finds a neighbor aggregator with no administration tag as its next bounce and gives the tag to that aggregator. If no aggregator owns the relating administration tag or no tag, the aggregator looks through an aggregator that has superior help from terrible to great. If there is no aggregator with not comparing the administration or better or no tag, the aggregator begins to discover an aggregator with a more terrible help from great to awful.

The diverse help prerequisites in the system cause the distinctive recurrence of information accumulation and transmission. Collecting and transmission are essential vitality utilization strategies for hubs. Thus, hubs regularly transmitting information parcels devour vitality quickly. As an outcome, the passing of these hubs has better consumption of energy. So administration label turn should be received in DDAR. Every aggregator utilizes the tag inverse to the present tag as its administration tag (for instance, there are five assistance necessities, the present tag of the hub is 1, the tag after label turn is 5), the activities from stage 2 to stage 4 would be performed again after the revolution.

6. RESULTS AND DISCUSSION

According to the rate of energy level, constructing the aggregation tree, grouping into the cluster and time proportion are the administration necessity parameters which decides the exhibition of the information collected during the transmission procedure and reenactment tests are actualized. The thickness of hubs and the number of layers don't influence the performance of systems. A few tests are structured, and the administration ensures the pace of each system is thought about. Table No: 1 demonstrates that the structure of the system doesn't influence the exhibition.

Energy Rate	Aggregation Tree	Clustering	DDAR
0	0	0	0

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20	18	13	8
40	25	20	16

Table No: 1 Energy Conservation

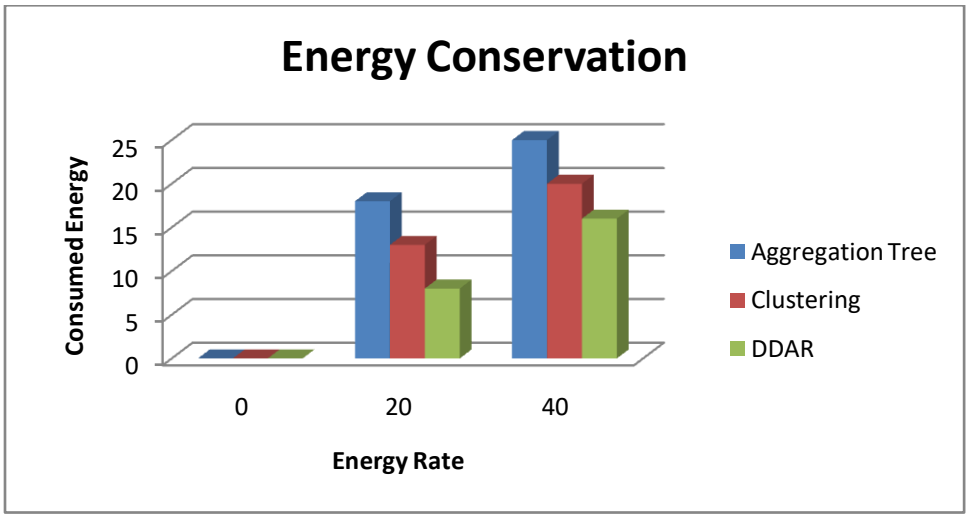

Figure No: 5 Energy Conservation

In a situation of the reenactment, the quantity of the sort of administration necessities and the estimation of every prerequisite is predetermined; necessities are arbitrarily appointed to the hubs. The midpoints are determined dependent on the estimation of fixed prerequisites. The consumption of energy is more in the existing framework when compared to the proposed DDAR and the outcomes are given in Table No.1 and Figure No.5.

7. CONCLUSION

In this work, DDAR is contrasted with the aggregation tree and clustering that shows the performance of DDAR better in energy utilization and preservation. In the systems, the likelihood of producing an information bundle, total proportion and the extent of aggregators are nature parameters that for the most part influence the likelihood of creating group information. DDAR begins with the particular delay necessities and decides the pertinent parameters during the transmission as per the idea of the system, along these lines guaranteeing the information

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legitimacy of different administrations. It is accepted that DDAR has an enhancement impact in the DiffServ systems with the same coherent structure (e.g., cluster systems).

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