Intelligent Automation & Soft Computing
DOI: 10.32604/iasc.2023.032265
Article

Adaptive Route Sink Relocation Using Cluster Head Chain Cycling Model in WSN

M. Sudha[1,*], P. Shanmugapriya[2], Rami Q. Malik[3] and Ahmed Alkhayyat[4]

[1]Department of Electronics and Communication Engineering, Paavai Engineering College, Namakkal, 637018, India
[2]Department of Electronics and Communication Engineering, Saranathan College of Engineering, Tiruchirappalli, 620012, India
[3]Department of Medical Instrumentation Techniques Engineering, Al-Mustaqbal University College, Hillah, 51001, Iraq
[4]College of Technical Engineering, The Islamic University, Najaf, Iraq
*Corresponding Author: M. Sudha. Email: gunasudhaa@gmail.com
Received: 12 May 2022; Accepted: 30 June 2022

Abstract: Wireless Sensor Networks (WSN) have revolutionized the processes involved in industrial communication. However, the most important challenge faced by WSN sensors is the presence of limited energy. Multiple research investigations have been conducted so far on how to prolong the energy in WSN. This phenomenon is a result of inability of the network to have battery powered-sensor terminal. Energy-efficient routing on packet flow is a parallel phenomenon to delay nature, whereas the primary energy gets wasted as a result of WSN holes. Energy holes are present in the vicinity of sink and it is an important efficient-routing protocol for WSNs. In order to solve the issues discussed above, an energy-efficient routing protocol is proposed in this study named as Adaptive Route Decision Sink Relocation Protocol using Cluster Head Chain Cycling approach (ARDSR-CHC2H). The proposed method aims at improved communication at sink-inviting routes. At this point, Cluster Head Node (CHN) is selected, since it consumes low energy and permits one node to communicate with others in two groups. The main purpose of the proposed model is to reduce energy consumption and define new interchange technology. A comparison of simulation results demonstrates that the proposed algorithm achieved low cluster creation time, better network error and high Packet Delivery Rate with less network failure.

Keywords: Cluster head; energy-efficient routing; chain routing; cycling approach; sink relocation; adaptive routing; WSN

1 Introduction

The advancements in industrial communication demand heavy performance from network whereas Wireless Sensor Network (WSN) lags behind due to energy-constrained sensor nodes. It usually experiences energy maintenance issues like power consumption whereas Software Defined Network (SDN) and Internet of Things (IOT) networks cannot provide energy to each sensor terminal. Many proposals have been made earlier to improve the energy level of sensor nodes by taking advantage of on-site spatial communication in order to extend the network lifetime of sensors and transmit huge volumes of sensed information. Sensor nodes are usually constructed in a network to achieve sufficient protection. Therefore, sensory information collected by the sensor nodes is highly relevant. The most widely used WSN application type is a cost-effective application in which routing-based, battery-operated sensor node is used for non-real settings. Therefore, the network lifetime of WSN is important to achieve efficient data collection and communication. Routing communication module also features various elements such as optional power consumption, knuckle sensing, and processing. The transmission of data has a benefit i.e., it can reduce the consumption of energy so as to enhance the lifetime of network.

The proposed objective defines different types of energy route management programs that raise a request on neighborhood node. This study organized WSN energy management-based differential flow with two-way factors. At first, the researcher consulted different studies conducted upon various energy packet delay mechanisms of sensor nodes. Then, the sensors related to sleeper node are considered and adaptive cluster routing is performed. An energy-efficient dynamic structural design is described based on energy consumption of network nodes.

Recently, an energy transfer-based approach was proposed in which the nodes can change the domain in case when the terminal gets exhausted. These energy-depleted nodes have limited harvesting opportunities and are set in place from nearby location. Wireless energy transfer is one of the popular techniques applied in recent times. However, different methods and procedures are necessary for efficient energy consumption of nodes through remote energy supply mechanisms.

Most of the studies conducted upon energy management focus on efficient energy consumption at nodes. The key objective of these studies is to create low-power applications and control energy supply. However, the studies also put efforts to ensure wireless sensor networks and efficient energy management, energy supply, and energy consumption go in parallel.

The current study is aimed at conducted a top-to-bottom survey for WSN designers in order to develop complete energy-saving route optimization solutions by considering the significant needs of the application. The current paper proposes a new energy-efficient route optimization mechanism using the latest specifications and adaptive cluster chain route technology. In this study, the researchers paid special attention towards the design of energy-efficient sensor networks to meet the needs of advanced applications.

In this study, a novel WSN has been designed by focusing on the exchanges between meeting notes and sustainability. The researcher also discussed about the mechanisms to make this possible and achieve adequate exchange among multiple requirements. To the best of researcher's knowledge, the current study is a first-of-its-kind attempt to bridge the research gap.

Wireless Sensor Networks are autonomous systems that contain numerous small sensor nodes with integrated sensing and data processing capabilities. In a sensor network, some other wireless networks too exist. In other terms, they function under basic constraints whereas sensor energy management is a big challenge for wireless sensor networks in terms of establishing a range of power resources. Wireless Sensor Network under Power Conditions (WSN-PC) enable the environment to reduce energy consumption with the help of strong and energy-efficient routing protocols. These communication protocols received considerable research attention in recent years. It is expected that the sensor should limit its energy consumption to the best possible levels. Sensors are expensive both in terms of energy storage and incorporation, since it is mostly deployed in challenging environments.

Most of the Internet of Things (IoT) applications have gained popularity in industries since it has automated WiFi and is applied in multiple domains such as military, internet communications and data transmission. On the other hand, Real-Time Wireless networks (RTWNs) are web-based ones. RTWNs typically distribute airspace sensors, actuators, nodes, relaying gateways and components to achieve specific real-time tasks. These components collectively run RTWN media over wireless network. Quality of Service (QoS) is a standard set for RTWNs, when the data is supplied frequently (from a gateway to sensor and finally to the driver), while node-to-end ES is a satisfactory means of measurement for real-time task deadlines.

In WSNs, data connection layer plays a key role in achieving the desired QoS, in terms of packet planning at the time of routing, and in case of wireless data processing. These tasks are highly challenging to accomplish than the sensing task. It features a data dissemination tool and a small node. WSN is designed specifically for multiple routing protocols in which data collection, storage, routing, power management, and energy awareness are essential design components. Due to energy constraints in sensor nodes, WSNs need to extend the lifetime of network while at the same time, the number of innovative technologies should also be increased.

Wireless networks are loaded with numerous low-resolution routing control transceivers and compact sensors with the help of well-positioned tools for fusing the information at highly-aligned nodes. Here, the cluster head is highly selective upon all sensory elementary knots of the delay during routing, and is responsible for sensing and gathering the information from the presented headset. If a communication node is received, then the cluster head may be subjected to any other additional communication while the information is reduced to synchronization process.

Wireless Sensor Networks (WSNs) is a basic feature of Internet of Things to collect data from multiple real-time applications and transmit the collected data to base station. WSN nodes are typically smaller and are battery-powered devices. As a result, network lifetime becomes increasingly important, since energy-efficient data collection and routing methods have also increased. One of the routing approaches i.e., Adaptive Mean Compressed Sensing (AMCS) demonstrates that WSN is highly dynamic and involves in data collection process.

The current study proposes an energy-efficient routing protocol named Adaptive Route Decision Sink Relocation Protocol using Cluster Head Chain Cycling (ARDSR-CHC2H) approach to enhance the communication with sink-inviting routes. At this point, Cluster Head Node (CHN) is selected since it allows low energy nodes to interact with rest of the nodes in two groups. The main purpose of the current study is to reduce energy consumption and present a new interchange technology.

2 Literature Review

Several energy-saving WSN techniques have been proposed in the last few years, while these studies focused mostly on power enhancement in battery-only sensor networks [1]. However, the solutions proposed cannot be applied universally. This scenario is common in case of other applications too such as agriculture and security application which requires quick and timely response [2]. Energy constraints in WSN can be addressed formally in terms of utility requirements.

Instead of conducting many studies upon energy-efficient routing solutions, a Systematic Literature Review (SLR) is the need of the hour to identify the issues at first about key adaptation period. The explanatory material has important position in terms of efficient power distribution [3]. These mechanisms have been proposed to achieve mixed energy efficiency and low energy consumption.

When conducting the systematic review on WSN, the most fundamental issue was found to be energy consumption. But it is overlooked by researchers and experts who have contributed to the development of advanced power applications as bandwidth network speed, battery, etc [4].

Then, the researchers doubted whether their information is unnecessary and the influence of distance between one node and another node results in a radius or range of less-data communication or much lesser than the data communicated. It has been inferred that this phenomenon is a result of spatial interpolation. The sensor must calculate the distance between the nodes using known or received signal strength to transmit the messages at the start of network [5]. If a node decides its sensory information to be unnecessary, it does not make an attempt to transmit the information. As a result, some of the complete nodes transmit their sensory information to less node in order to achieve distortion constraints.

Therefore, the amount of the energy consumed reduces due to transmission of unnecessary information. However, the techniques proposed in these studies are equally important alike the environmental monitoring systems. So, technical constraints must be considered [6] before developing a new system. Wireless Sensor Network applications cannot be used for the collection of all information from sensors. The systems proposed earlier are usually divided into dependent-duty cycle, profitable data, and mobility programs.

Duty-based bicycle program switches between sleep and wake-up times with the help of efficient power of the nozzles [7]. In data-driven approach, several methods have been adopted to maintain some level of accuracy and reduce data distortion. Mobility-based programs, on the other hand, can be used in the conversion of mobile environments to multiple sinks. In other terms, it can also be used based on their functionalities on one environment or part of a network [8]. This scenario creates on-demand binary tree from the given target node, while the sub-graph binary contains all the edges of a tree. WSN routing is a multi-way process and sliding node that sends the parcels is the standard path from source node to reach the destination. When current node fails, it can be easily transferred to another node.

Real-time forecasting of qualified links is also combined with forecasting of regular quality link to provide reliable routing choices so as to handle poor link quality in challenging sectors [9]. In WSN, data aggregation is still an essential and time-consuming task. Kurcle-DDAS was proposed in the study conducted earlier, which calls for a new cluster-based aggregation tree based on Minimum Delay Accumulation Planning (Assembly Member) in line with energy-efficient distributed planning methodology. This study approach differs from the previous projects in such a way that link control package or large standalone package is adopted.

In Real-Time Wireless Networks (RTWNs), most of the IoT applications are web-based ones. RTWNs usually have Time Division Multiple Access (TDMA)-based media access control mechanisms [10] which often meet node-to-end service-specific Quality of Service (QoS) requirements.

RTWNs play an important role in packet planning and achieve the desired capability. When RTWNs are large and require many interruptions to be handled as a complex, it becomes a simultaneous problem as in regular transmission [11]. When a disruption is detected in a particular sensor node, it needs to be changed frequently for some time to monitor the workload associated with the environment. Thus, it is important to understand how RTWNs come up with online workload changes in modern demographic applications.

Power competence results in storing the valuable energy in sensor nodes. It is one of the most important tasks since WSN plays a fundamental role in determining network lifetime [11]. Many WSN protocols have been proposed earlier, but the advanced scalability of hierarchical routing protocols are considered only based on the package. To be specific, the sensor is often battery-powered [12], and in most of the situations, it is subjected to the available energy.

In literature, Leach Wireless Sensor Networks have been developed to meet unique requirements of the users [13]. Sensors have a primary objective to accomplish i.e., transmit the collected information to Base Station (BS) sensor through application protocol, configured in sensor networks [14]. Many approaches demand additional energy upon data transmission. The purpose of this study was to resolve this problem through Cluster Head algorithm. In order to reduce energy consumption in a group of cells-based world, prototype routing is consumed by key work nodes on sustainable aggregation protocols. In case of node unavailability, the load should be spread across instead of maintaining it.

Sensor-based smart devices have become a part of human lives. Advanced sensor devices paved the way for the emergence of various sensor-based automation systems [15]. Due to the lack of infrastructure, power constraints and interference, long performance studies cannot be accomplished easily in WSN sensors.

Physical and environmental conditions are monitored by WSN. Low Energy Adaptive Clustering Hierarchy (LEACH) protocol selects the nodes in a random fashion. In LEACH protocol, cluster heads are selected in a probabilistic manner to balance the load in rotating crowd [16]. Various shortcomings exist in LEACH protocol i.e., it cannot be selected in a bunch due to multiple or no presence of cluster heads. The cluster head generates random energy to be used in the cluster and can be selected at the edge of the network.

In WSN, each battery runs its sensor node and does not charge comfortably. In other terms, the battery needs to be constantly changed, especially in remote areas and unfavorable environments. Due to these limited capabilities of sensor terminal [17], WSNs become densely populated. So, the subnetwork should be available to maximize the lifetime of network. Most news bulletins are based on centralized management and lifetime optimization of sensor networks since this phenomenon increases the network lifetime of sensors.

The research community has started focusing lifetime optimization as a viable research field. In fact, at increased levels, node failure can negatively impact the outcomes of applications [18]. If sensor nodes do not consider the following attributes such as memory failure, energy, and cost savings, in terms of computational power, such as wear failure, it is likely that WSN exists in a worn effect. Some nodes that suffer from sensitivity are much faster and older than others [19]. Thus, it significantly reduces the lifetime of network and poses an issue for network reliability. In literature, this issue has been investigated in multiple ways.

For example, lifetime reliability assumes that the failure rate of a terminal is not dependent on how far it has been used [20]. This hypothesis implies that low memory can accept soft mistakes only, if it is due to wear-related fail-silent (failing nodes do not provide spontaneous release) and failure malfunction (reduction in node recovery). The lifetime reliability of both incorrect and sensor-causing nodes gradually decline over a period of time.

3 Energy-Efficient Routing Based on Adaptive Route Decision Sink

Energy-efficient routing protocols are implemented with widespread compatibility and acceptability for Wireless Sensor Networks. Most of the cluster-based hierarchical routing protocols use BS as the main controller to select Cluster Head (CH), which in turn increases the consumption of energy and time travel delay. In order to improve and proactively use energy-efficient routing algorithms, enhance network lifetime and reduce data confidentiality, the researchers proposed Adaptive Route Decision Sink Relocation protocol using Cluster Head Chain Cycling approach in WSN.

In Adaptive Power Dispersion analysis, it has been found that a WSN connection can improve the lifetime of data package. Fig. 1 shows the architecture of ARDSR-CHC2H. The data resemble communicates to the node based on routing, whereas the closest node transfers the packets. Here, sensors perform system-wide broadcasting that allows one to browse a unique system of all contact data. The sensor needs to be focused so as to reduce power consumption in message-driven mode.

As a cluster group, the monitored node remains the sink node with coverage sensor. It can communicate with Cluster Head during energy-saving process and sensor masonry head information. In addition to this potential, efficient transmission protocols have also been proposed for wireless sensor networks.

3.1 Sparse Network Construction Model

Sparse network improves the dynamic movement of nodes since it directly updates the route links from route node. In this process, dynamic network topology constructor mode is updated periodically to route the reception by following packet flow mechanism. The dynamic nodes, which collect routing information in sink node $S \in V$, are presented as graph theory $G = (V, E)$ by a collective subject $\varphi D\theta$ at Y of each cycle. If a cluster group is evaluated, then Min representation is provided for every cluster group edge, E as per dynamic cycles, given below i.e., two-node P1 and P0 states are given below.

$$P_0: \min_{||\theta||_0} - \rightarrow node\ refers\ to\ \varphi D\theta = Y\ and\ P_1:\ node\ referral\ to\ \varphi D\theta = X \quad (1)$$

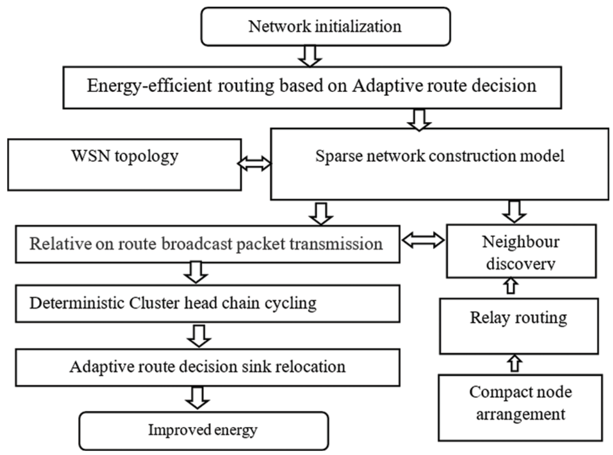

Figure 1: Architectural diagram of ARDSR-CHC^{2}H

Based on the synchronized regular interval, the packet is arrived on route to the closest cluster head so as to transfer the packet to collective nodes as [x1, x2, x3, . . . , xN]. Here, N denotes the number of samples under representation. Let Y be the displacement point of parent node with a prolonged periodic routing, R at medium, M.

$$\mathrm{Y} = \mathrm{Parent\ node\ P,\ cover\ node\ N\ i} = 1\ \varphi \mathrm{ixi} \in \mathrm{R,\ M} \quad (2)$$

From Eqs. (1) and (2), φi∈ RM and M mode at initial < N are confirmed as nodes. This technique points at making a plain dynamic topology at a specific routing sink.

The source n-dimensional vector X→c is derived after WSN displacement time. This is done based on accurate measurement of the vector Y, plane CS, and energy capacity. Finally, the dimension of the sink at traffic t is given as follows.

$$transmit\ at\ time\ T_{cst} = \sum\nolimits_{(i,j)\ remains\ communal\ traffic\ \in E} tijcij * x\{t,\ \ Y\}, \quad (3)$$

This means ∈Tij connects (i, j) traffic and results in performance appraisal system based on transmission tariff, Euclidean distance ∈ E. While c_{ij} denotes the connection costs between communal node and sleeping nodes, j and i. In this study, a data model of the link traffic unit is considered.

3.1.1 Node Readying Capabilities

The nodes tend to monitor the self-organized device nodes across two determined steps or topologies. The unit location of the sensor area is quiet, due to which it is considered as an interesting feature. But the unit system in the sensor, in an unplanned way, achieves a bachelor's degree in energy. While the network's life-time preparation for self-organization is a serious problem in channel area unit.

3.1.2 Cell Combination Based Algorithm Clustering of Resource Cells as Protocols as Groups with Networks

The sensor is densely distributed in node area. So, the power of the sensor terminal is usually controlled. In synthesis algorithm, the observer is divided into hexagonal cells by taking data from the geographical location of the nodes considered for the study. All these clusters contain a minimum of 7 polygonal cells. The same cluster-ID is given for a cluster and so the cluster head is available from each node and each central cell of the cluster. Cell morphology is probably circular in order to increase the channel energy.

3.1.3 Cluster Head Choice Parameter

The initial energy of the node, bachelor's degree, energy range of different distance units, and other measurable factors help in the selection of cluster heads. Regional units that exclude each other like some cluster numbers and multiple types have been described earlier. In addition to these, some regional quality attributes like unit quality, node type and complexity have also been discussed.

3.2 Relative on Route Broadcast Packet Transmission

Relative broadcasting reviews the use of a sensor network, in which every sensor terminal is loaded with sensory information which equally transmits the packet. Therefore, all the sensor nodes measure sensor variables and periodically transmit the sensory information to sink nodes to remain as sleeping nodes. Besides, it can be assumed that the sensor nodes are set as per random Poisson point procedure.

Algorithm 1: Relative Broadcasting

Step 1: Network initialization on transmission link TL to route the traffic RT

Step 2: Compute randomized route Link L ← N nodes as (dn)

Process the parental node which covers the node delay n route

N→ > Dy→LRP

Neighbor Link on route probation on delay Path Dp = D_p

$$_{Relay}(Dp) = \propto_{11} + \propto_2 d^n + \propto_{12} = \propto_1 + \propto_2 d^n \tag{4}$$

Step 3: Compute the regional on N nodes

Traffic-coordinated function remains

$$R \rightarrow D_p(X, Y), \text{ cover node } E(L) \geq \propto_1 \frac{n}{n-1} \frac{L}{d_m} - \propto_{12} \tag{5}$$

Step 4: Transition link for L = 1 to N Evaluate XL Link and region cover YL

Cover the XL and YL on region discovery form Eq. (4)

End For

Step 5: Using DX, find the distance to the node with the highest regularization (distance)

$d_m = \sqrt[n]{\frac{\propto_1}{\propto_{2(n-1)}}}$ medium coverage distance at m

Step 6: Compute relative node One: The attention node with the shortest link in the course of attaining the results.

node = A1, A2 on region coverage on DP

Step 7: return the delay location Node resembles Mn

When the network starts with distance between sensor nodes that is covered with a relay on sink, the messages are transmitted or received from the stock market and are evaluated using signal strength. If a node finds its sensory information to be unnecessary, it does not make an attempt to send the information. As a result, some of the only-complete nodes send its sensory information to the node of the trough to meet energy constraints. Therefore, the amount of the energy consumed gets reduced in terms of sending unnecessary information. However, the methods proposed in these studies cannot be used for wireless sensor network applications, since the information collected from all the sensors are equally important.

3.3 Deterministic Cluster Head Chain Cycling

In this step, two rounds are performed similarly for chain development. CH chain sequence is an interior chain of a group. Routing is selected after the cluster is formed. This adaptive ode covers the waking node to form a chain of nodes in the assembly. Each node receives information from one of its previous neighbors. At 'Create Meeting point' on communal node, each chain is formed from the nodes far from CH. Then, the nearest neighbor of the node is selected based on signal strength upon next node in node chain.

Till the last node chain is added, the execution is continued. Each node selects the transition channels on 'sing with reefed route table' to avoid collisions in the cluster. Once the chain is built, the time to send the CH data by the node is specified. BS begins the formation of middle chain of CH while rest of the positions transmit the balance energy to CH. BS has the smallest distance with CH. While high energy leader becomes CH and forms a chain of chapters based on the information received earlier. Then, BS applies the greedy algorithm to create the chain in CH.

Input: compute the coverage node Cn on Route chain Rc,

Output: optimized congestion occurrence:

Step 1: Initialize RL on Mobile Node

Step 2 For Random node Rn varies each state {

Initialize Parental node P→Cn on route link L

For (medium cover Mn→RL) each

Make a central node as cluster Node

Group to coverage node Cn

Step 3: If delay sleeping terminate

Reorders route table compute remains L

To refresh the delay on each link o awaking node

Step 4 Esteem he clusters the flow and delays →weightage Nw ← delay Dw.

Whether closer node Mn→delay free congestion if Yes

Step 5: if neighbor transition on RL→L

End If;

Return Mn

End for

The routing cluster determines low-power relay detectors so that it can be used for sink interference. When an event is reported to have occurred in CH, high-powered nodes may switch to another route. Here, both speed as well as data volume are detected in lesser quantities. When node activity gets recognized with delay, the frequency of the asset must be adjusted so as to increase the node. In terms of energy performance, it does not have to act alike communal sink.

The nodes in a given area can split the neonatal degenerative network or create energy pores. The addition of extensions can be avoided even now by distributing or grabbing the optimal opportunity to tip some relay ends. This helps in improving energy balance, avoiding sensor heat and ensuring stability coverage, and K-connectivity between the ankles. The possibility of the optimized stationary sink reduces the average hop distance of all the ends of the adjacent tank.

3.4 Adaptive Route Decision Sink Relocation Protocol

The impact of unnecessary routine models can be measured through energy failures in 'n' bandwidth. This scenario can increase the usage of communication resources and processing costs. Adaptive decision technology adjusts the sampling rate of each sensor while it also ensures that the application requirements are met in terms of night coverage or information accuracy. Further, the energy stored in the nodes are also used. It enters the mode on packet flow among other waking nodes.

Besides, whenever the protocols are designed, the nodes must be taken into account. This is due to random distribution of residual energy. Due to differences in the amount of the energy collected, the number of nodes with low residual energy may be high. On the other hand, sleep times and low transmission ranges can also be assigned to route the transitions. Another open perspective that should be taken into account is that the battery degradation, over a certain period of time, can affect network performance due to creation of multiple protocols for leakage, memory loss etc.

Step 1 initialize the cluster G (Ver as train node, Erf as reflect node),

Find coverage routRcs = {(vr1, vr2), (vr2, vr3), . . . , (vri, vri + 1)},

Step 2 compute for parental pf packet transmission for js = 2 to sr secondary

If Relay Js→ S ++ relay node

Check if node sleep cluster resembles

Else

Return node coverage

End if

Step 3: check valid the route on coverage if (js = 2 and vjpacket

Decide sleeping node vr with the relay transmitter at on not else

Rn ← cn : Else

Avid sleeping node (vj, vj + 1, . . . , vsi + 1) to dismiss

End if

Step 4: check route propagation delay

Step 5: for related hop access h = srto jr

Decide on the sink to perform transmission

At transmission time delay occurrence on coverage node, remain to change the route

G ← Rl ++

Update route table check average time At

Return Rl→G;

End For

End for

These protocols modify the number of nodes per cluster in such a way that head nodes are selected for every chain. This protocol avoids the close ends of the routing process, even though long chains exist in the closest region of BS. This is to ensure even distribution of energy across the network. The head node of each chain is available, while the leader of BS being the closest node, has high volume of energy compared to other nodes. The leader from each chain remains the closest node with BS and other high energy nodes in the chain. The head reader aggregates and sends the information to BS from different sources of information and from different chains to individual cluster headers.

4 Result and Discussion

The current section evaluates the proposed model in terms of energy consumption. The proposed Adaptive Route Decision Sink Relocation protocol using Cluster Head Chain Cycling approach (ARDSR-CHC2H) was validated in WSN environment against the existing technique i.e., Software-Defined Wireless Sensor Network (SDWSN), a multi-hop Packet transmission technique (MHPT). Transportation is a main task to be accomplished by WSN nodes that are designed with NS2 dynamic network model using a substantial network simulation tool. The sensor nodes of a device in WSN are extensively connected with each other.

Tab. 1 shows the details of the data set used to execute the systematic demo. It is challenging to accomplish less energy consumption. For example, there is a long way to go in terms of creating a propaganda about the first node of node terminal, its masonry head and cluster head nodes. This may be the main cause of energy consumption.

Table 1: Parameters and their processing values

Parameters	Value
Network type	Dynamic topology
Node arrangement	Random moveable node suing dynamic topology
Network size	600 m × 600 m
Primary energy	0.8 J/10o kb per 10 ms
Number of nodes protocol	100/AODV/TCP-UDP
Transmission power	100W on residual energy
Simulation tool	Visual framework

Fig. 2 shows the parental route in a cluster in which energy efficiency was focused on traffic to determine the low-cost pathway. In general, the networks are configured to deliver on behalf of emerging areas. On the other hand, network transactions are avoided when trigger error is acceptable.

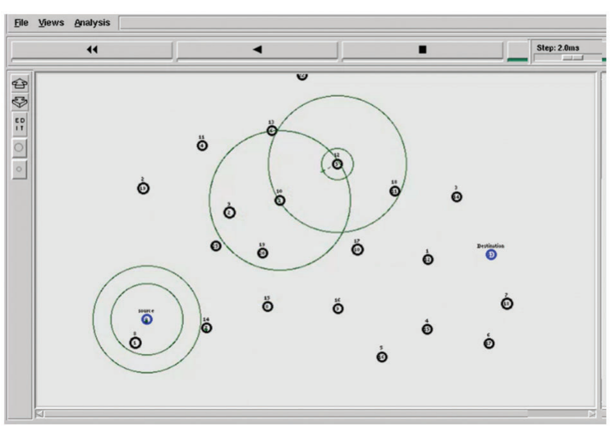

Figure 2: Parental route initialization on traffic determination

Fig. 3 shows the formation of cluster chains, where the sink node remains the route for relay while the coverage node forms the residual energy on each packet transmission.

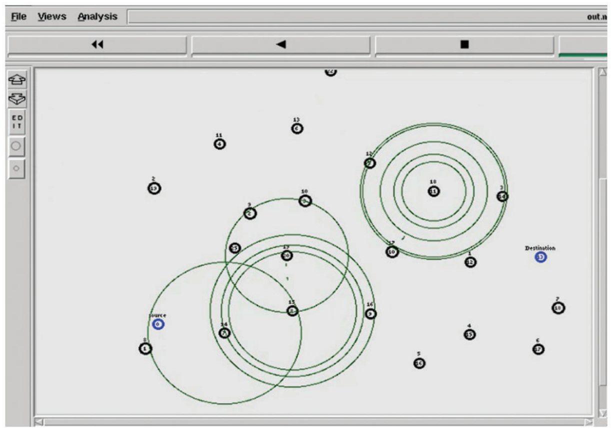

Figure 3: Cluster head chaining between the relay nodes

4.1 Impact of Packet Arrival Rate

Packet Arrival Rate (PAR) is used to assess the quality of network. This value is calculated as the ratio between received packet and the packet generated by the source to reach the destination. This is a trace file and a script to produce the result and is measured as follows.

$$\text{PDR} = \text{Received packets}/\text{Generated packets} * 100 \tag{6}$$

The basic task is to use back elastic virtual network algorithm to re-energize all the nodes in data transfer path that travel towards the strong target and optimize data packet transmission. Tab. 2 shows the packet transfer rate on relay chain response of the proposed and existing models.

Table 2: Packet transfer rate on relay chain response

Packet transfer on relay chain in Mille-sec (ms)			
Number of nodes/transmission data 100 kb per mean 10 ms	SDWSN	MHPT	ARDSR-CHC2H
20	10.34	18.23	25.67
40	28.62	32.51	46.31
60	31.12	42.71	61.82
80	48.79	55.32	76.15
100	52.21	66.47	84.31

Fig. 4 shows the packet transfer rate on relay chain response to achieve minimum cost in communication speed with no trade-off. The simulation results show improvement in energy consumption.

4.2 Impact of Packet Delay Analysis

To establish a ground terrain, data exchange occurs between the chain nodes which remains the high-end cause for delay. The time taken by a raw node to deliver a normal amount of data is called ‘end-to-end delay’.

This packet is received by the receiver so that the sender can retrieve the trace document and there exists a difference between the generated times.

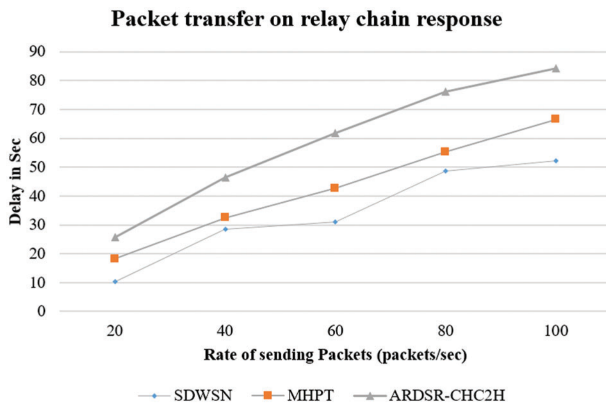

Figure 4: Packet transfer on relay chain

Tab. 3 shows the delay analysis and the proposed system results for end of the current system in comparison with different methods.

Table 3: Packet delay analysis

Packet delay analysis in (ms)			
Rate of sending packets/sec/ transmission data 100 kb per mean 10 ms	SDWSN	MHPT	ARDSR-CHC2H
10	1.34	1.56	2.12
20	5.25	5.72	6.34
30	3.25	4.23	6.56
40	8.41	7.59	9.23
50	6.22	8.47	9.56

The results of the presented method are shown in Fig. 5. The proposed methodology determined delay packet rate over a specified number of seconds.

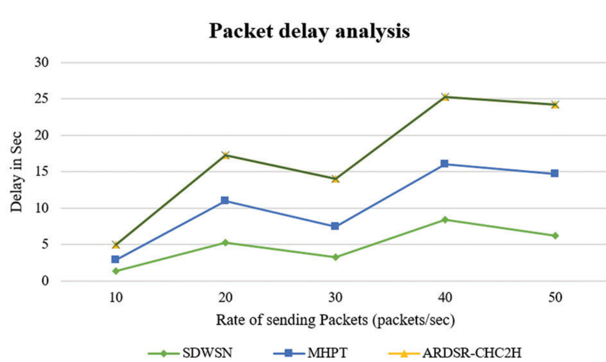

Figure 5: Packet delay analysis

Fig. 6 shows delay occurrence on the route to make tolerance on another path. However, some differences exist in this regard. Although it is only 1 packet/sec, the proposed method allows the delays in truck networks. The delay gets reduced if the target is moved close to the source node. Otherwise, the delay increases.

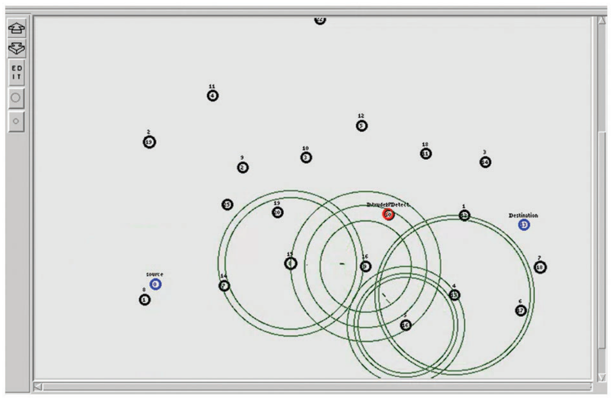

Figure 6: Delay tolerance on route propagation

4.3 Impact of Throughput Evaluation

The data pack residue is normally distributed in the total number of data packets divided by total number of packets.

Routing procedure verifies the sleeping node in traffic-aware routing algorithm. Fig. 7 shows the throughput evaluation results. To extend the best homogeneity of data approximation on packet retention, there is no statistics available to maintain the order ideas in a specified number of packet packets and number of each outgoing packets. This packet routing phenomenon led to inefficiency in conventional load metric mechanisms.

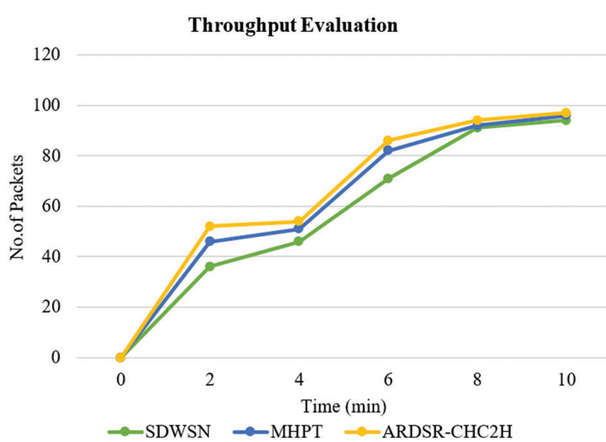

Figure 7: Throughput evaluation

4.4 Impact of Packet Time Delay Analysis

The packet is supplied from the source within target network. In this conventional method, the number of datasets can reach the end of the network regardless of the starting point of the network.

Blame nodes are nothing but sleeping requital nodes which expand their distribution across the network. Fig. 8 shows the performance of delivery ratio. To be specific, there is a need exists to get started with decentralized routing and follow-up on relay node request. The representative transmission packets exist in relay sensor network space. Here, the change module sends a positive response after the completion of pre-verification task. A change is requested at the mobile reception module.

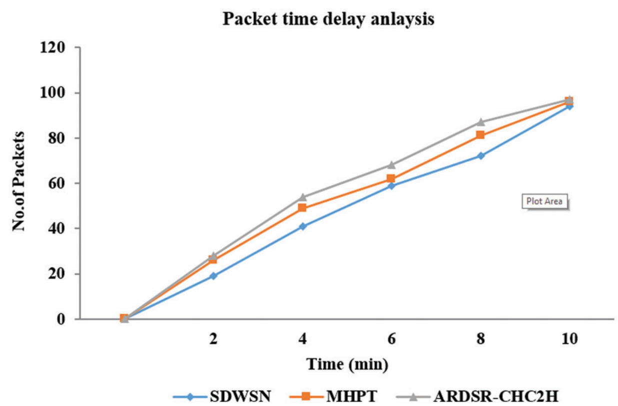

Figure 8: Performance of delivery ratio

4.5 Impact of Energy Gain Performance

Each zone and the central information in the system such as language, general information, tank's information and importance of the chain to multicast can be accessed for a progressive multicast. Thus, the next language stage is shown attention. An adaptive algorithm was used to improve identification in this process (in IAA).

As shown in Fig. 9, different methods are used to interpret the power efficiency. The planned energy duration got increased in the study. If there is no aim in gaining energy, then it occurs only to repay the original union with no underlying cell and the talent of the event. However, if any interference is possible, this condition causes temporary interruption.

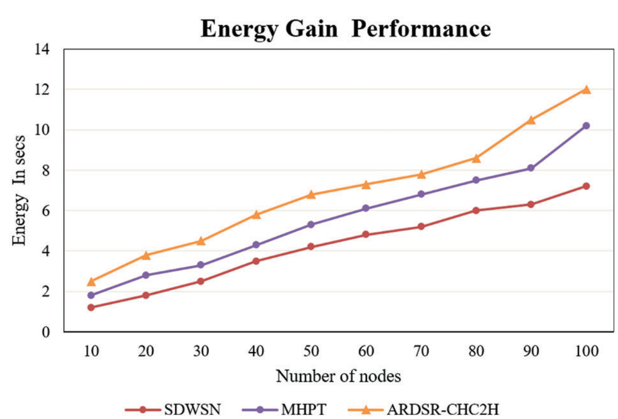

Figure 9: Energy gain performance

5 Conclusion

To conclude the current study, an energy-efficient routing protocol has been proposed in the current study named Adaptive Route Decision Sink relocation protocol using Cluster Head Chain Cycling. The aim of the proposed method is to reduce energy consumption. The proposed method uses route aggregation process to learn from the training dataset so as to resolve the variance density problem with time. The proposed method eliminates the need for network reconfiguration. Cluster chain reduces the amount of communication through well-organized data. The proposed ARDSR-CHC2H was found to have powerful and economical mechanisms that can improve the lifetime of network using adaptive delay tolerance. The current study took all the efforts to develop a state-of-the-art technique to reduce energy consumption of nodes. Reconstruction Error Analysis results, achieved by the proposed method, demonstrate that the data can be retrieved with high fidelity. It can be concluded that at base station, the transmission energy level got improved. The proposed method achieved minimum transmission energy and energy-efficient data aggregation and increased network lifetime. In future, fault tolerant scheme can also be developed for WSN.

Funding Statement: The authors received no specific funding for this study.

Conflicts of Interest: The authors declare that they have no conflicts of interest to report regarding the present study.

References

[1] O. Younis and S. Fahmy, "HEED: A hybrid, energy-efficient, distributed clustering approach for ad hoc sensor networks," *IEEE Transactions on Mobile Computing*, vol. 3, no. 4, pp. 366–379, 2004.

[2] C. Wenjie, C. Lifeng, C. Zhanglong and T. Shiliang, "A realtime dynamic traffic control system based on wireless sensor network," in *2005 Int. Conf. on Parallel Processing Workshops (ICPPW'05)*, Oslo, Norway, pp. 258–264, 2005.

[3] T. Liu and F. Li, "Power-efficient clustering routing protocol based on applications in wireless sensor network," in *Proc. of the 5th Int. Conf. on Wireless Communications, Networking and Mobile Computing (WiCOM '09)*, Beijing, China, pp. 1–6, 2009.

[4] M. C. Vuran and I. F. Akyildiz, "Spatial correlation-based collaborative medium access control in wireless sensor networks," *IEEE/ACM Transactions on Networking*, vol. 14, no. 2, pp. 316–329, 2006.

[5] R. Singh and G. Mittal, "Lifetime enhancement of cluster head selection for MIMO routing algorithm based on weighted sum method for WSN," *International Journal of Engineering Research and Applications*, vol. 3, no. 5, pp. 1894–1898, 2013.

[6] G. Gao, H. Zhang and L. Li, "A reliable multipath routing strategy for wirelesshart mesh networks using subgraph routing," *Journal of Computational Information Systems*, vol. 9, pp. 2001–2008, 2013.

[7] Y. Li, L. Guo and S. K. Prasad, "An energy-efficient distributed algorithm for minimum-latency aggregation scheduling in wireless sensor networks," in *2010 IEEE 30th Int. Conf. on Distributed Computing Systems*, Genoa, Italy, pp. 827–836, 2010.

[8] W. Ye, J. Heidemann and D. Estrin, "Medium access control with coordinated adaptive sleeping for wireless sensor networks," *IEEE/ACM Transactions on Networking*, vol. 12, no. 3, pp. 493–506, 2004.

[9] K. Biswas, V. Muthukkumarasamy, E. Sithirasenan and K. Singh, "An energy aware heuristic-based routing protocol in wireless sensor networks," in *2014 17th Int. Conf. on Computer and Information Technology (ICCIT)*, Dhaka, Bangladesh, pp. 53–58, 2014.

[10] M. T. Nguyen and N. Rahnavard, "Cluster-based energy-efficient data collection in wireless sensor networks utilizing compressive sensing," in *MILCOM 2013–2013 IEEE Military Communications Conf.*, San Diego, CA, USA, pp. 1708–1713, 2013.

[11] J. Y. Chang and P. H. Ju, "An energy-saving routing architecture with a uniform clustering algorithm for wireless body sensor networks," *Future Generation Computer Systems*, vol. 35, pp. 128–140, 2014.

[12] S. Manda, N. Archana and N. Umarani, "Maximizing the lifetime of wireless sensor networks using CRT based packet splitting algorithm," *International Journal of Advancements in Research & Technology*, vol. 2, no. 4, pp. 48–58, 2013.

[13] J. Shen, A. Wang, C. Wang, P. C. K. Hung and C. F. Lai, "An efficient centroid-based routing protocol for energy management in wsn-assisted IoT," *IEEE Access*, vol. 5, pp. 18469–18479, 2017.

[14] B. Nazir and H. Hasbullah, "Energy-efficient and QoS aware routing protocol for clustered wireless sensor network," *Computers and Electrical Engineering*, vol. 39, no. 8, pp. 2425–2441, 2013.

[15] J. Bahi, M. Haddad, M. Hakem and H. Kheddouci, "Efficient distributed lifetime optimization algorithm for sensor networks," *Ad Hoc Networks*, vol. 16, pp. 1–12, 2014.

[16] N. A. Khan, K. Saghar, R. Ahmad and A. K. Kiani, "RAEED-EA: A formally analysed energy efficient WSN routing protocol," in *2016 13th Int. Bhurban Conf. on Applied Sciences and Technology (IBCAST)*, Islamabad, Pakistan, pp. 346–349, 2016.

[17] J. Uthayakumar, M. Elhoseny and K. Shankar, "Highly reliable and low-complexity image compression scheme using neighborhood correlation sequence algorithm in WSN," *IEEE Transactions on Reliability*, vol. 69, no. 4, pp. 1398–1423, 2020.

[18] K. M. Awan, A. Ali, F. Aadil and K. N. Qureshi, "Energy efficient cluster based routing algorithm for wireless sensors networks," in *2018 Int. Conf. on Advancements in Computational Sciences (ICACS)*, Lahore, Pakistan, pp. 1–7, 2018.

[19] W. Abushiba, P. Johnson, S. Alharthi and C. Wright, "An energy efficient and adaptive clustering for wireless sensor network (CH-leach) using leach protocol," in *2017 13th Int. Computer Engineering Conf. (ICENCO)*, Cairo, Egypt, pp. 50–54, 2017.

[20] M. Razzaq, D. D. Ningombam and S. Shin, "Energy efficient K-means clustering-based routing protocol for WSN using optimal packet size," in *2018 Int. Conf. on Information Networking (ICOIN)*, Chiang Mai, pp. 632–635, 2018.