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A SECURE DATA COLLECTION FROM SENSOR NODES USING MOBILE SINK IN COMPUTATIONALLY CONSTRAINED WIRELESS SENSOR NETWORKS

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ABSTRACT

In wireless sensor networks for every data transmission or data collection, sensor power will be reduced and power saving is one of the major problem in this case. Rolim et al. [1] proposed a method of data gathering by using adaptive stop times, at every node based on network traffic delay time is increased to collect more data from sensor nodes, and if the sink node is not selected properly then it will lead to increase network delay time. In this paper we introduced a new secure reliable data collection and data transmission method to collect sensed data by reducing power consumption. We simulated proposed method using network simulator tool by increasing data rate 100, 200, 300, 400, 500 KBPS, performance of proposed method is evaluated using metrics like network delay, power consumption, overhead, packet drop and delivery ratio. At the end, we compare our results with existing method and our methods exhibit better results when compared with existing method.

Keywords: *Sensor node, Data Collection, Data Transmission, Authentication, Network Metrics, Network Traversal, Random walk, Rendezvous Point.*

1. INTRODUCTION

The day to day development in data communication system has chance of using new modern devices for network communication [4]. The size of Wireless Sensor Network (WSN) is very small, due to its size it can be easily deployed in different remote locations. In wireless network almost all nodes are distributed and are logically inter connected with each other. Logically inter connected nodes are useful to increase reliability and fault tolerance of wireless sensor network. Implementation cost of WSN is not expensive one. The nodes which are present in WSN can be easily controlled and monitored from different remote locations [3].

Each sensor node in wireless Sensor Network periodically updates data and communicates with neighbor sink node. It is also acting as an interface media between network and its user. It is also treated as base station of sensor nodes in wireless networks. The main role of sink node is to collect data from sensor and forward to server vice versa. In distributed computing environment the same sink node is called coordinating server and its role is to retain or moving data and reply to user queries. In most of the situations sink node is not in the range sensor node, therefore data from sensor node to sink node or sink node to sensor node is passes through intermediate sensor nodes by establishing routing [5].

This paper is organized as in section II we discussed about related work, in section III proposed work is presented, in Section IV shown simulated results, and in section V brief about conclusion.

2. RELATED WORK

The authors Brown et al. [2] introduced adaptable routing method for wireless sensor networks for different climatically conditions like fire accident in smart building constructions. In their method they assumed that base station is fixed at one centralized location, each and every sensor node will send data to base station using multi hop routing path, mobile station must be known its position, and mobile stations are roaming uncontrolled manner. They also consider sensor networks are suitable for fire accident applications, in this case sensors are used for sensing and reporting fire conditions will

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destroy because of fire. They introduced new fire fighter equipment will be acting as sink nodes and provide sensed data without interruption. Their method has four stages like stationary phase, movement phase, reservation, and connection. If mobile station changes its position immediately it provides route information to base station through multi hop routing. Each sensor node will decide itself to send the messages through mobile station are its own path. To maintain route information they created temporary tree which will lead to overhead in constructing trees. If the node changing its position then hop count is increased and keep on increasing hop value may be lead to confusion stage [6].

2.1. DATA COLLECTION USING ROLIM et Al. METHOD

Rolim et al. [1] proposed a method for wireless sensor networks to gather sensed data using adaptive biased sink mobility model. In their method complete network is assumed to be into various regions, and sink node is deployed with mobility property will move from one location to other over a network. If the sink researches one node immediately it will stop certain period of time to gather data from that node and one data is collected it will move to next node to collect data in the same direction. Sensor nodes which are used in their method are not moving from its location. Area (A_S) occupied by the sensor node is calculated by using following equation.

$$A_S = \pi\, r_s^2 * P_s$$

Where,

r_s= radius of area occupied by the sensor node

p_s= number of packets from sensor node

Number sensor nodes have packets to transmit is calculated by using following equation.

$$n_S = d_s * A_s$$

Where, d_s = density of area occupied by the sensor node.

Number sensor nodes do not have packets to transmit is calculated by using following equation.

$$n_r = d_n * (A - A_s)$$

Where,

d_n= density of the network

A = Total area of the network

Therefore, total number of sensor nodes present in the network is calculated by using the following equation.

$$n = n_r + n_s$$

Rolim et al. [1] concluded in their research paper that in their method adaptive stop timings are used for each and every sensor node (n_s) present in the network and if the network traffic high proportionally increase stop time to collect data. If the delay time at the sensor node is increased then automatically sink will stay more to collect more data from that node. Introducing adaptive stop times based on network traffic to collect sensed data is really good idea but if we are not chosen sink node properly then there is a chance to getting more delay in the data transmission.

The researchers [7] conduct survey on hierarchical routing protocol in WSN. In their scheme network is divided into different clusters and established cluster based routing to transfer packets over network. They also discussed about chain based routing and grid based hierarchical routing methods. But they are not used security mechanism for data transmission. The authors [8] worked on wireless body area networks to closely monitor patient health situation to diagnose and continue further treatment. They discussed security mechanisms and in their approaches they protect data from simple security attacks but their method is not protecting data from server masquerade attacks and user masquerade attacks [9].

With modern developments in human life style most of them are not interested in agriculture field. Even the formers who are having forms are not in a position to monitor their field continuously 24 hours per day. To produce more profit in agriculture field lots of investigation is required.

To conducted practical experiment in Agricultural field with sensor nodes and deployed sensor nodes in agriculture field to observe day to day environment and functions. These nodes are sensed information about environment to collect details about temperature, moisture, climate, and activities of workers in the field. After collecting all these data analyze and based on analysis summary report is generated about production.

Our idea is to deploy sensors devices in the field with cameras and server is deployed in formers house. With help of cameras sensor nodes collect data and transferred to server. Which is helpful to

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former too closely observe workers and field to predict from loses. It is the main motivation to do this research work.

3. PROPOSED RESEARCH METHOD

In this paper, we proposed new novel reliable secure routing algorithm to transmit data to destination node. In our method we proposed new routing algorithm based on two factors, one is selection of rendezvous point and selection of relay node. Some of the notations used in our proposed routing algorithm is listed below.

N_{source} = Source Node

N_{sink} = Sink Node

P_{query} = Packet query

R_p = Rendezvous point

N_{relay} = Relay Node

$N_{neighbor}$ =Neighboring node

P_{relay_n} = Relay path new

P_{relay_o} = Relay path old

P_{relay_seq} = Relay path sequence number

P_{relay_start} = Relay path startup

P_{relay_close} = Relay path close

D_{TX} = Distance of transmitter

Multi hop step by step route selection algorithm for data transmission is discussed below. Our idea is to fix center node as sink to collect and transmit data to destination sink node. At the end we listed how our method providing secure exchange of sensed authenticated data.

Step 1: If any event raises immediately $R_p$is selected for communication.

Step 2: Sink node will send $P_{query}$to R_p with $ID_{sink}||hop_{count}||D_{TX}$

Step 3: $R_p$broadcasts P_{query} by setting hop_{count}=0

Step 4: if the node $N_{neighbor}$receives P_{query} , simply it broadcast P_{query} to immediate neighboring nodes by incrementing hop count by 1.

Step 5: if next node hop value > 1 then every node compare packet arrived time stamp (TS_a).

Step 6: if an event occurs immediately nodes jointly process and one node will be acting as source node.

Step 7: Data is send when source data is matches with P_{query}.

Step 8: when next hop node battery is low then immediately select next neighbor node is next hop node.

$N_{Source} \rightarrow N_{neighbor}$ & $N_{neighbor} \rightarrow N_{Source}$

Step 9: if N_{sink} within radio range of R_p then N_{sink} will receive data from $R_p$otherwise N_{sink} will select $N_{relay}$to recive packet from R_p.

Step 10: Identification of relay node:

Step 10.1: N_{sink} will send relay node request to its neighbor nodes.

$N_{Sink} \xrightarrow{R_{req}} N_{neighbor}$

Step 10.2: $N_{neighbor}$can be send relay message R_{rply} to sink node.

$N_{neighbor} \xrightarrow{R_{rply}} N_{sink}$

Step 10.3: N_{sink} will select close nearest node as relay node.

Step 10.4: Sink send P_{relay_start} to R_p through chosen relay node.

$N_{Sink} \xrightarrow{P_{relay\_start}} N_{relay} \xrightarrow{P_{relay\_start}} R_p$

Step 11: if N_{sink} moves out of coverage of N_{relay} then new N_{relay} node is selected by following previous step.

Step 12: if R_p received P_{relay_start} then

Step 12.1: if already P_{relay_o} exists for the same N_{sink} then R_p send P_{relay_close} to P_{relay_o}.

$R_p \xrightarrow{P_{relay\_close}} P_{relay\_o}$

Step 12.2: P_{relay_o} is maintained as alternative path until getting P_{relay_start} message.

3.1. Network Setup & Rendezvous Point Estimation

Step 1: A Sensor network is simulated with N number of nodes.

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Step 2: Let $A_{i,j}$is an adjacency matrix is a connections between nodes. If $A_{i,j}$ = 1 then there is an edge between ith node to jth node.

Step 3: Sink node with help of network partitioned network into i X j cells. Midpoint of cell will be connected to four sensor nodes shown in the figure 1.

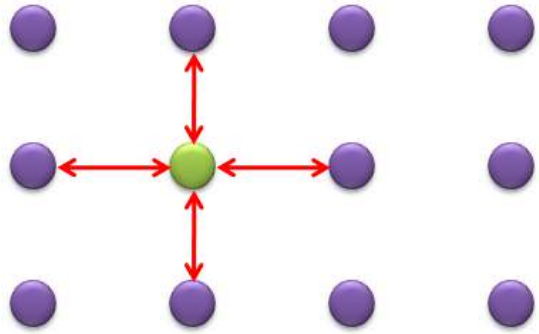

Figure 1: Center Node Connected With Four Nodes

Step 4: Sink node used random walk approah to cover all nodes to collect sensed data. Network traversal is done by using random walk approach and it is shown in figure 2.

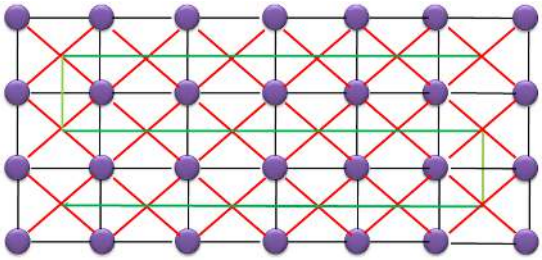

Figure 2: Network Traversal Using Random Walk

Step 5: From the current node calculate network communication cost.Wireless sensor network communication cost is calculated by using following equation.

$$C = \sum T_{DG} * T_C * \eta$$

Where,

T_{DG}= Time of data generation

T_C= Expected count value of transmission

η= Power consumption for communication

Step 6: the node which is having less communication cost (C) will acting as next sink node (rendezvous point).

For every sensor node separate counter value is maintained. For example, CTR_ibe the counter variable of ith sensor node. Degree of each node is represented by usingλ_i. First set $CTR_i = 0$ for all sensor node and then following steps are used to select next node.

Step 7: when current sink node reaches area of node 'i'then updates the value of C_i by increamenting with one ($CTR_i = CTR_i + 1$). For each every visit C_i value is updated and stored in sink node.

Step 8: select of next hop visit by sink node with degree $\lambda_i$is calculated by using following equation.

$CTR_{nbr} = \sum_k CTR_k, \forall\ (i,k)_{\text{pair}}$

Step 9: the probabilty of next hop node visit is calculated by using following formula.

$$P_k = \frac{1 - \frac{CTR_k}{CTR_{nbr}(i)}}{\lambda_i - 1}, \forall\ CTR_{nbr} \neq 0$$

3.2. Power Consumption of each sensor node

Step 1: Power consumption of Transmitter:

$E_{TX} = E_{bit\_t} * N_{bits} + E_{hop}$

Where,

E_{TX}= Total power consumption of Transmitter

E_{bit_t}=Power consumption of single bit for transmission

N_{bits}= Number of bits

E_{hop}= Power consumption to identify next hop node in the forward direction

Step 2: Power consumption of Receiver:

$E_{RX} = E_{bit\_r} * N_{bits} + E_f * N_{bits}$

Where,

E_{RX}= Total power consumption of receiver

E_{bit_r}= Power consumption of single bit for receiving

N_{bits}=Number of bits

E_f= Power consumption of each bit for framing data packet

Step 3: Power consumption if the sensor node in idle mode:

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$E_{snooze} = E_{ps} * N_{bits}$

Where,

E_{snooze}= Total power consumption if the sensor node in idle mode

N_{bits}= Number of bits

E_{ps} = Power consumption per second during sleeping mode

Step 4: Total power consumption:

Total power consumption of any sensor node is calculated using the following equation:

$$E_{Total\_c} = E_{TX} + E_{RX} + E_{snooze}$$

3.3. Secure Data Exchange

In this Section, we proposed improved security mechanism for wireless sensor networks. Proposed model consists of four steps: user registration phase, login phase, authentication phase, and password change phase.

3.3.1. User registration phase

Step 1: User $U_i$send registration request message $\{ID_i, P_{rem\_i} = h(r_i \oplus P_i)\}$ to sensor node through secured channel.

Step 2: Sensor node receive user id and password of user then choose a random number $r_{sink}$for each user and calculate:

$$R = r_{sink} \oplus h(ID_i||P_{rem\_i})$$
$$C = ID_{sink} \oplus h(P_{rem\_i}||ID_i)$$
$$N = h(ID_i||ID_{sink}||key||r_{sink}) \oplus h(P_{rem\_i} \oplus ID_i)$$
$$H_i = h(ID_i||ID_{sink}||r_{sink}||P_{rem\_i})$$

Sensor node receive authentication ticket for user through secure channel and ticket consists of (Nonce, R, C, H, r_i).

3.3.2. Login phase

Step 1: User inserts authentication ticket to card reader, user enters ID, password, and then ticket reader will perform the following tasks.

Step 2: Calculate remote user password$P_{remi} = h(r_i||P_i)$, get random number $r_{sink}$from R and ID_{sink} from C.

$$r_{sink} = h(UID_i || P_{remi}) \oplus R$$
$$ID_{sink} = C \oplus h(P_{remi}||ID_i)$$

Step 3: Calculate

$$H_i^* = h(ID_i||ID_{sink}||r_{sink}||P_{remi})$$

and compare H_i^* withH_i if it is equal then authenticated or otherwise user is not authenticated.

Step 4: Prepare login request message $\{ID_{new\_i}, N^*, U_{rem\_i}, H_1, TS_1, S_2, X\}$ and send to sink node.

$$ID_{new\_i} = ID_i \oplus h(r_{sink})$$
$$U_{rem\_i} = r_{rem\_u} \oplus h(ID_i||r_{sink})$$
$$N^* = N \oplus h(P_{remi} \oplus ID_i) = h(ID_i||ID_{sink}||K||r_{sink})$$
$$H_1 = h(ID_i||r_{rem\_u}||r_{sink}||ID_{sink}||P_{remi}||N^*||TS_1)$$
$$S_2 = S_i \oplus h(ID_i||r_{sink})$$
$$X = h(N^*) \oplus P_{remi}$$

3.3.3. Authentication phase

After receiving login request message from user sink node performing the following task to verify user authenticity.

Step 1: calculate$(TS_2 - TS_1) \leq \Delta t$, where TS_2 is the time of login request message received by sink node, Δt is minimum then only sink node will perform remaining tasks or otherwise simply reject login request message.

Step 2: Sink node get user ID_ifromID_{new_i}, calculateN^*, get password $P_{remi}$from X, $S_i$fromS_2, and r_{rem_u} fromU_{rem_i}. Sink node calculate

$$ID_i = ID_{new\_i} \oplus h(r_{sink})$$
$$N^* = h(ID_i||ID_g||K||r_{sink})$$
$$P_{remi} = X \oplus h(N^*)$$
$$r_{rem_u} = U_{rem_i} \oplus h(ID_i||r_{sink})$$
$$H_1^* = h(ID_i||r_{rem_u}||r_{sink}||ID_{sink}||P_{remi}||TS_1||N^*||S_2)$$

& verified with received H_1 from user.

Step 3: Sink node generate random numberr_2, prepare message $\{R_2, N_1, C_2, S_3, TS_2, TS_3, H_2\}$

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to sensor node and sent prepared message to sensor node.

$$R_2 = r_2 \oplus h(K_{sink})$$
$$N_1 = N^* \oplus h(K_{sink}||R_2)$$
$$C_2 = r_{rem_u} \oplus h(r_2||K_{sink})$$
$$S_3 = S_2 \oplus h(K_{sink}||r_2||TS_2)$$
$$TS_3 = TS_1 \oplus h(K_{sink}||TS_2||r_2)$$
$$H_2 = h(ID_i||ID_{sink}||S_3||r_2||r_{rem_u}||N^*||TS_2||TS_1)$$

Step 4: After receiving login request message from sink node sensor node verified message authenticity by calculating H_2^*. If both H_2&H_2^* are same then message is authenticated or otherwise message is not authenticated.

$$H_2^* = h(ID_i||ID_{sink}||S_3||r_2||r_{rem_u}||N^*||TS_2||TS_1)$$

4. SIMULATION RESULT

Proposed method is simulated using Network Simulator (NS2) and results are discussed in the following sections.

4.1. End to end transmission delay

End to end transmission delay is a time difference between packet generation time at source node and packet receiving time at destination node. Is one of the performance evaluation of a network, based on the application of sensor nodes network, and delay in the WSN is played vital role. Depending on reliable energy efficient methods, there exist overhead and hand-off in terms of delay.

4.1.1. Data Rate Vs Delay

End to end transmission delay of proposed method and Rolim.P et al. [1] is calculated by varying increasing data transaction rate as 100, 200, 300, 400, and 500 KBPS. A graph is plotted based on the results produced by both schemes and it is shown in figure 3. With experimental results we come to know that our method showing less transmission delay when compared with Rolim.P et al. [1] method.

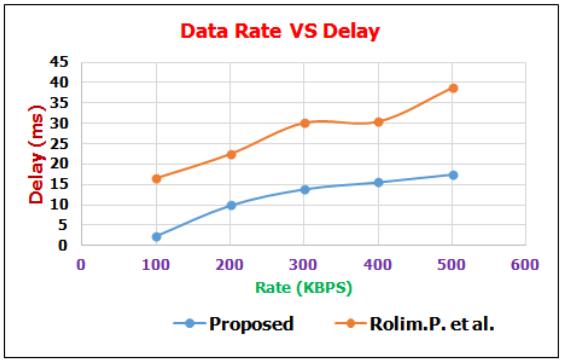

Figure 3: Data Rate Vs Delay

4.1.2. Number of Nodes Vs Delay

End to end transmission delay of proposed method and Rolim.P et al. [1] is calculated by varying number of nodes in WSN as 20, 40, 60, 80, and 100 nodes. A graph is plotted based on the Results produced by both schemes and it is shown in figure 4. With experimental results we come to know that our method showing less transmission delay when compared with Rolim.P et al. [1] method.

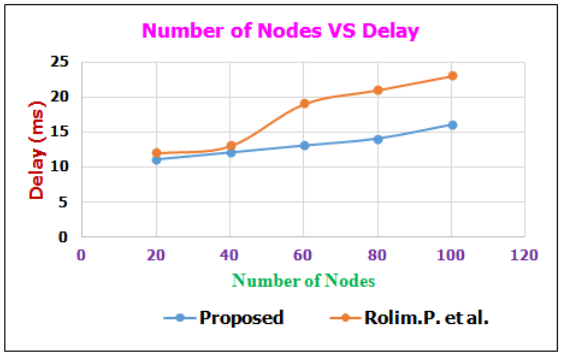

Figure 4: Number Of Nodes Vs Delay

4.1.3. Number of Sources Vs Delay

End to end transmission delay of proposed method and Rolim.P et al. [1] is calculated by varying number of sources in WSN as 5, 10, 15, 20, and 25 sources. A graph is plotted based on the Results produced by both schemes and it is shown in figure 5. With experimental results we come to know that our method showing less transmission delay when compared with Rolim.P et al. [1] method.

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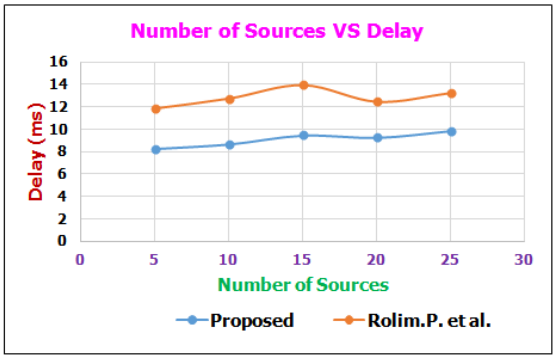

Figure 5: Number Of Sources Vs Delay

4.2. Power Consumption

Total power consumption for data transmission.

4.2.1. Data Rate Vs Power

Power consumption of proposed method and Rolim.P et al. [1] is calculated by varying increasing data transmission rate as 100, 200, 300, 400, and 500 KBPS. A graph is plotted based on the results produced by both schemes and it is shown in figure 6. With experimental results we come to know that our method consuming less power when compared with Rolim.P et al. [1] method.

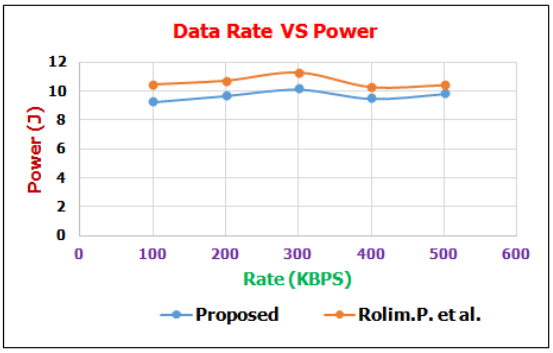

Figure 6: Data Rate Vs Power

4.2.2. Number of Nodes Vs Power

Power consumption of proposed method and Rolim.P et al. [1] is calculated by varying number of nodes in WSN as 20, 40, 60, 80, and 100 nodes. A graph is plotted based on the Results produced by both schemes and it is shown in figure 7. With experimental results we come to know that our method consuming less power when compared with Rolim.P et al. [1] method.

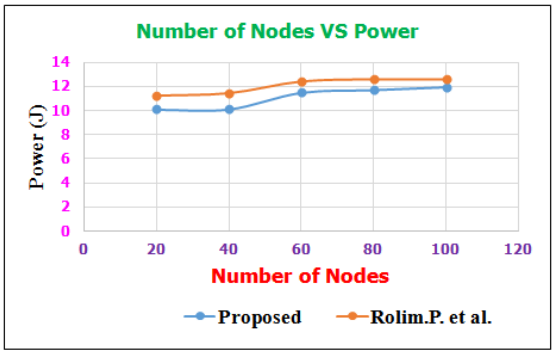

Figure 7: Number Of Nodes Vs Power

4.2.3. Number of Sources Vs Power

Power consumption of proposed method and Rolim.P et al. [1] is calculated by varying number of sources in WSN as 5, 10, 15, 20, and 25 sources. A graph is plotted based on the Results produced by both schemes and it is shown in figure 8. With experimental results we come to know that our method consuming less power when compared with Rolim.P et al. [1] method.

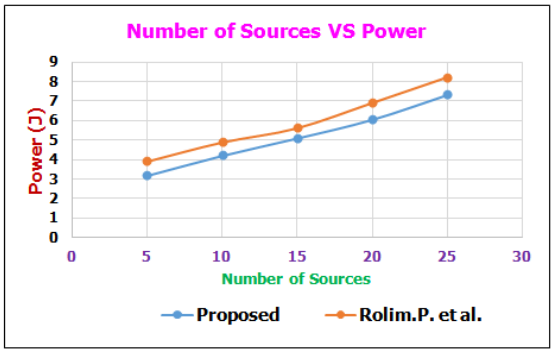

Figure 8: Number Of Sources Vs Power

4.3. Overhead

Overhead is defined as the total number of routing control packets normalized by the total number of received data packets.

4.3.1. Data Rate Vs Overhead

Overhead of proposed method and Rolim.P et al. [1] is calculated by varying increasing data transmission rate as 100, 200, 300, 400, and 500 KBPS. A graph is plotted based on the results produced by both schemes and it is shown in figure 9. With experimental results we come to know that our method showing less overhead when compared with Rolim.P et al. [1] method.

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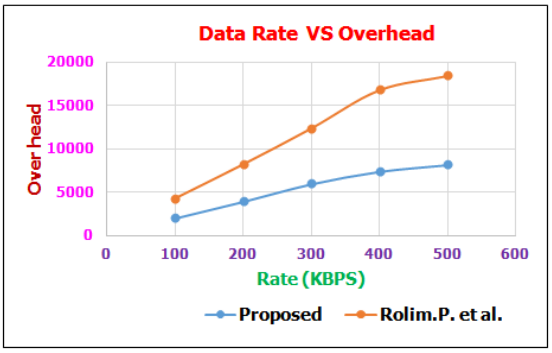

Figure 9: Data Rate Vs Overhead

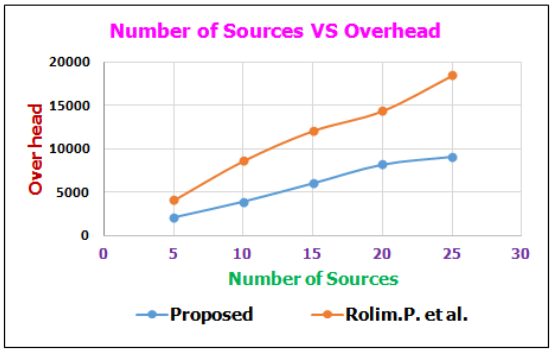

Figure 11: Number Of Sources Vs Overhead

4.3.2. Number of Nodes Vs Overhead

Overhead of proposed method and Rolim.P et al. [1] is calculated by varying number of nodes in WSN as 20, 40, 60, 80, and 100 nodes. A graph is plotted based on the Results produced by both schemes and it is shown in figure 10. With experimental results we come to know that our method showing less overhead when compared with Rolim.P et al. [1] method.

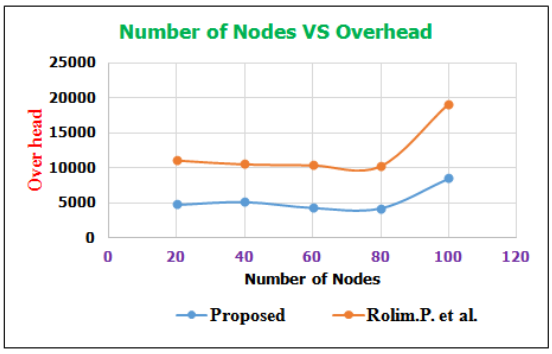

Figure 10: Number Of Nodes Vs Overhead

4.3.3. Number of Sources Vs Overhead

Overhead of proposed method and Rolim.P et al. [1] is calculated by varying number of sources in WSN as 5, 10, 15, 20, and 25 sources. A graph is plotted based on the Results produced by both schemes and it is shown in figure 11. With experimental results we come to know that our method showing less overhead when compared with Rolim.P et al. [1] method.

4.4. Packet Drop

Data is transmitted from source to destination using sink nodes. Packet drop is defined as number of packets missing or dropping during transit.

4.4.1. Data Rate Vs Drop

Number of packets drop during transmission is estimated for both proposed method and Rolim.P et al. [1] by varying increasing data transmission rate as 100, 200, 300, 400, and 500 KBPS. A graph is plotted based on the results produced by both schemes and it is shown in figure 12. With experimental results we come to know that in our method number of packets drop during transit is minimal when compared with Rolim.P et al. [1] method.

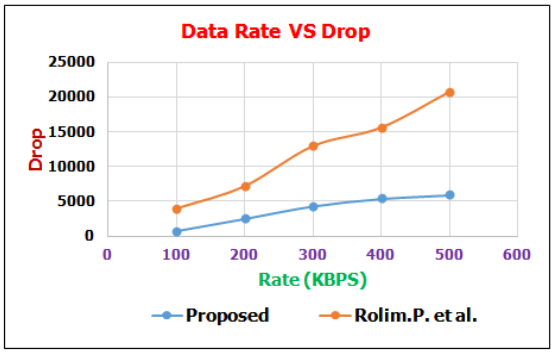

Figure 12: Data Rate Vs Drop

4.4.2. Number of Nodes Vs Drop

Number of packets drop during transmission is estimated for both proposed method and Rolim.P et al. [1] by varying number of nodes in WSN as 20, 40, 60, 80, and 100 nodes. A graph is plotted based on the Results produced by both schemes and it is shown in figure 13. With experimental results we come to know that in our method number of

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packets drop during transit is minimal when compared with Rolim.P et al. [1] method.

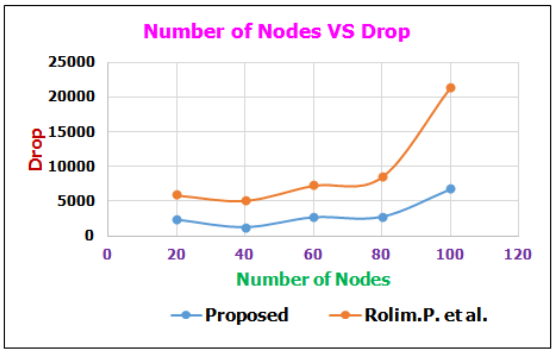

Figure 13: Number Of Nodes Vs Drop

4.4.3. Number of Sources Vs Drop

Number of packets drop during transmission is estimated for both proposed method and Rolim.P et al. [1] by varying number of sources in WSN as 5, 10, 15, 20, and 25 sources. A graph is plotted based on the Results produced by both schemes and it is shown in figure 14. With experimental results we come to know that in our method number of packets drop during transit is minimal when compared with Rolim.P et al. [1] method.

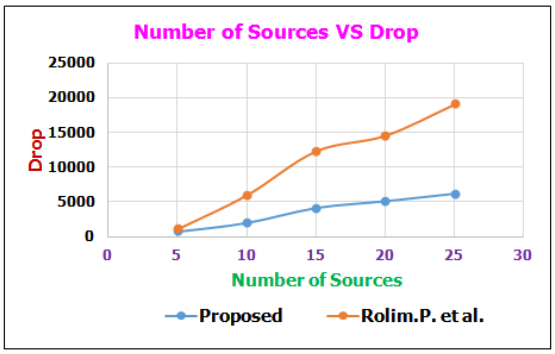

Figure 14: Number Of Sources Vs Drop

4.5. Delivery Ratio

Delivery ratio defined as a ratio of total number of data packets received by the receiver successfully and total number of data packets transmitted at sender side.

4.5.1. Data Rate Vs Delivery Ratio

Packet delivery of proposed method and Rolim.P et al. [1] is calculated by varying increasing data transmission rate as 100, 200, 300, 400, and 500 KBPS. A graph is plotted based on the results produced by both schemes and it is shown in figure 15. With experimental results we come to know that in our method packet delivery ratio is high when compared with Rolim.P et al. [1] method.

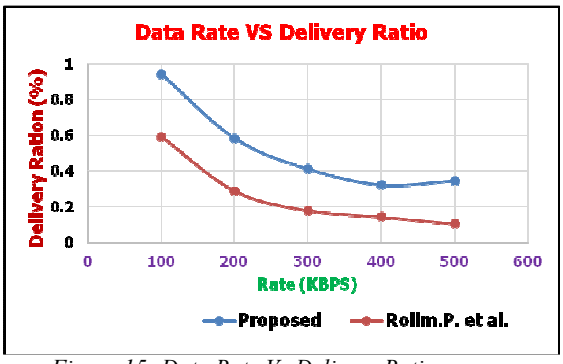

Figure 15: Data Rate Vs Delivery Ratio

4.5.2. Number of Nodes Vs Delivery Ratio

Packet delivery of proposed method and Rolim.P et al. [1] is calculated by varying number of nodes in WSN as 20, 40, 60, 80, and 100 nodes. A graph is plotted based on the Results produced by both schemes and it is shown in figure 16. With experimental results we come to know that in our method packet delivery ratio is high when compared with Rolim.P et al. [1] method.

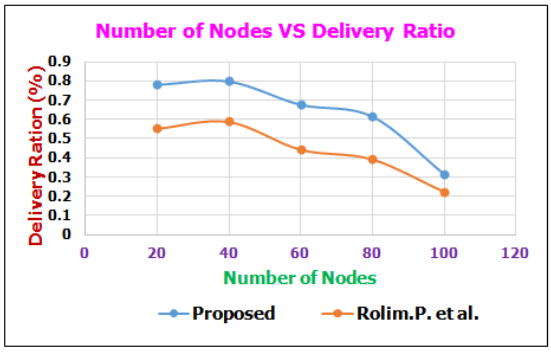

Figure 16: Number Of Nodes Vs Delivery Ratio

4.5.3. Number of Sources Vs Delivery Ratio

Packet delivery of proposed method and Rolim.P et al. [1] is calculated by varying number of sources in WSN as 5, 10, 15, 20, and 25 sources. A graph is plotted based on the Results produced by both schemes and it is shown in figure 17. With experimental results we come to know that in our method packet delivery ratio is high when compared with Rolim.P et al. [1] method.

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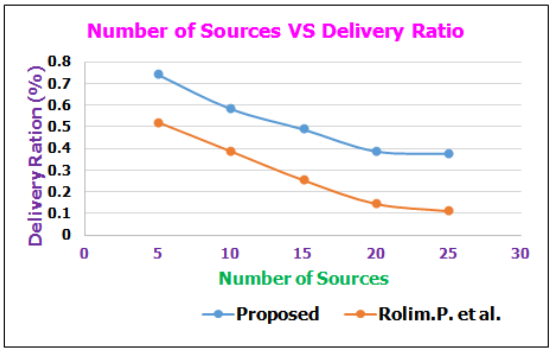

Figure 17: Number Of Sources Vs Delivery Ratio

5. MAJOR FINDINGS

Wireless sensor network has independent hardware devices equipped with sensors are not physically connected but all are logically connected with each other to provide services to its users. WSN can be used in many applications and it is more useful to society. The main functions of WSN are collection of data from sensor nodes, transmitted data from one sensor node to other using different kind of routing protocols, network node link monitoring, and dissemination of data. Limitations of sensor nodes are battery power, calculation, memory, network bandwidth, and transmission range.

In general sensor nodes in wireless network are placed in remote locations it is impossible or permit to change its battery with new one frequently. This situation may provide different challenges to many researchers to find different solutions to enhance the performance of wireless sensor network. Out of many research problems on wireless sensor network our research proposal mainly focuses on the following research findings:

Focus on the role of sink mode in the wireless network.

- To analyze how sink node facing problems when heavy traffic overload occurs in neighbor sensor node.
- To study traffic overload and power consumption problem and present a new method to solve the problems which are faced by sink node.
- To fix rendezvous point of sensor with maximum battery power.
- To propose the best shortest path or next alternative path using random walk approach for mobile sink to collect data effective data in wireless sensor network.
- To present a new model of routing to enhance the efficiency of wireless sensor network functions.
- Compare the performance of proposed method with existing method using quality of service parameters.

6. CONCLUSION

In this paper, we proposed power efficient data collection and secure data transmission technique. It consists of three phases: first setup network using NS2 simulator, estimation of rendezvous point to collect data from sensor nodes, use random walk procedure to collect more data from sensors, and apply security mechanism to secure exchange from one node to data centre. Performance of current scenario is observed and calculated by using network performance evaluation metrics like delay, packet delivery ratio, power consumption, overhead, and packet drop. Same parameters are used to evaluate performance of Rolim et al [1] method.

Network delay of proposed method 30% less than Rolim et al. [1], power consumption 12% is less than Rolim et al. [1], overhead of proposed is 60% less than Rolim et al. [1], packet drop of proposed method 72% less than Rolim et al. [1], and packet delivery ratio of proposed method 50% higher than Rolim et al. [1]. At the end, we come to know that our proposed method showing better results when compared with existing Rolim et al. [1] data collection and communication method.

In future, we are planning to enhance performance by increasing number of rendezvous points to collect more information from sensor nodes by optimizing sensor power consumption.

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