VGDRA Scheme for Mobile-Sink Based WSN With Masking Encryption

Aashna Hassan
PG Student
Department of Electronics and Communication Engineering
Mount Zion College of Engineering

Ambi Rachel Alex
Assistant Professor
Department of Electronics and Communication Engineering
Mount Zion College of Engineering

Abstract

In wireless sensor networks, exploiting the sink mobility has been taken into consideration as an excellent approach to stability the nodes strength dissipation. The statistics dissemination to the mobile sink is a challenging mission for the useful resource restrained sensor nodes because of the dynamic community topology caused by the sink mobility. For efficient facts shipping, nodes need to reconstruct their routes toward the modern-day vicinity of the cellular sink, which undermines the energy conservation aim. On this paper, provided a virtual grid primarily based dynamic routes adjustment scheme that ambitions to decrease the routes reconstruction price of the sensor nodes whilst preserving almost most suitable routes to the cutting-edge vicinity of the mobile sink. Proposed a hard and fast of conversation guidelines that governs the routes reconstruction procedure thereby requiring only a confined quantity of nodes to readjust their statistics transport routes in the direction of the cellular sink. Simulation consequences exhibit reduced routes reconstruction cost and improved network life of the VGDRA scheme with high protection using masking encryption.

Keywords- Energy Efficiency, Mobile sink, Wireless Sensor Network (WSN), Masking Encryption

I. INTRODUCTION

WIRELESS sensor network (WSN) - a self-organized network of tiny computing and communication devices (nodes) has been widely used in several un-attended and dangerous environments. In a typical deployment of WSN, nodes are battery operated where they cooperatively monitor and report some phenomenon of interest to a central node called sink or base-station for further processing and analysis. Traditional static nodes deployment where nodes exhibit n-to-1 communication in reporting their observed data to a single static sink, gives rise to energy-hole phenomenon in the vicinity of sink. Sink mobility introduced in [1] not only helps to balance the nodes' energy dissipation but can also link isolated network segments in problematic areas [2]. Figure 1 shows wireless network topology.

Similarly, numerous application environments naturally require sink mobility inside the sensor field [3] e.g., in a disaster control machine, a rescuer geared up with a PDA can pass across the disaster area to search for any survivor. Similarly, in a conflict field environment, a commander can attain real time information approximately any intrusion of enemies, scale of assault, suspicious activities etc through field sensors whilst on the circulate. In an intelligent transport machine (ITS), sensor nodes deployed at numerous factors of hobby - junctions, car parks, areas susceptible to falling rocks, can offer early warnings to drivers (cell sink) well ahead in their physical approach.

Exploiting the sink's mobility allows to extend the community lifetime thereby alleviating electron-hole problem; however, it brings new demanding situations for the statistics dissemination technique not like static sink eventualities, the community topology becomes dynamic as the sink maintains on converting its vicinity [4]. To cope with the dynamic community topology, nodes want to hold tune of the brand new location of the mobile sink for efficient records transport.

In the past few years, an extensive research that addresses the potential of collaboration among sensors in records collecting and processing and in the coordination and control of the sensing activity have been performed. But, sensor nodes are restrained in strength deliver and bandwidth. Therefore, innovative strategies that put off power inefficiencies that would shorten the lifetime of the network are enormously required. Such constraints mixed with a standard deployment of big wide variety of sensor nodes pose many challenges to the design and control of WSNs and necessitate electricity-cognizance in any respect layers of the networking protocol stack. For instance, on the community layer, it is incredibly applicable to find strategies for power-efficient course discovery and relaying of facts from the sensor nodes to the BS in order that the life of the community is maximized.

A Wireless Sensor Network (WSN) contain hundreds or thousands of these sensor nodes. These sensors have the ability to communicate either among each other or directly to an external base-station (BS). A greater number of sensors allows for sensing over larger geographical regions with greater accuracy. Figure 1 shows the schematic diagram of sensor node components. Basically, each sensor node comprises sensing, processing, transmission, mobilizer, position finding system, and power units. The same figure shows the communication architecture of a WSN. Sensor nodes are usually scattered in a sensor field, which is an area

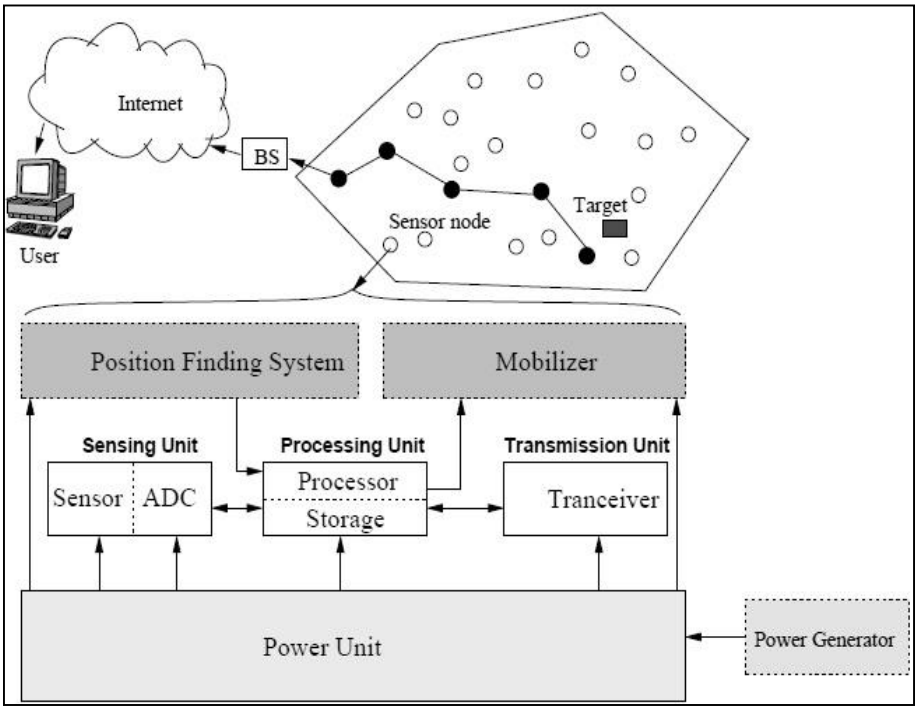

Fig. 1: Network Topology with Sensor Components

Where the sensor nodes are deployed. Sensor nodes coordinate among themselves to produce high-quality information about the physical environment. Each sensor node bases its decisions on its mission, the information it currently has, and its knowledge of its computing, communication, and energy resources. Each of these scattered sensor nodes has the capability to collect and route data either to other sensors or back to an external base station. A base-station may be a fixed node or a mobile node capable of connecting the sensor network to an existing communications infrastructure or to the Internet where a user can have access to the reported data. Nodes gather the observed data from the nodes in their vicinity during the absence of the sink and then proactively or reactively report data to the mobile sink.

II. EXISTING SYSTEM

In this paper, a novel scheme called Virtual Grid based Dynamic Routes Adjustment (VGDRA) is proposed for periodic data collection from WSN. Unlike the present answers, which enhance information transport overall performance both by employing a couple of cell sinks or by means of deploying great nodes at strategically crucial points within the sensor field, the proposed scheme does now not impose any such constraints. It objectives to optimize the trade-off among nodes strength consumption and information transport performance using a single cellular sink while adhering to the low-fee topic of WSN. The proposed scheme permits sensor nodes to maintain almost top of the line routes to the brand new place of a cellular sink with minimum network overhead. It walls the sensor field right into a digital grid of okay same sized cells and constructs a virtual spine network produced from all the mobile-headers. Nodes close to the centre of the cells are appointed as mobile-headers, which can be chargeable for facts collection from member nodes within the cell and turning in the facts to the cellular sink the use of the digital backbone community. The goal at the back of such virtual structure creation is to decrease the routes re-adjustment price because of sink mobility so that the discovered facts is brought to the mobile sink in an strength efficient manner. Further, VGDRA also sets up communication routes such that the stop-to-end delay and energy cost is minimized in the facts transport segment to the cellular sink. The cellular sink movements along the periphery of the sensor field and communicates with the border cellular-headers for facts collection. The routes re-adjustment method is governed by way of a fixed of regulations to dynamically deal with the sink mobility. Using VGDRA, only a subset of the cell-headers needs to take part in re-adjusting their routes to the latest location of the mobile sink thereby reducing the communication cost. Simulation results reveal decreased energy consumption and faster convergence of VGDRA compared to other state-of-the art.

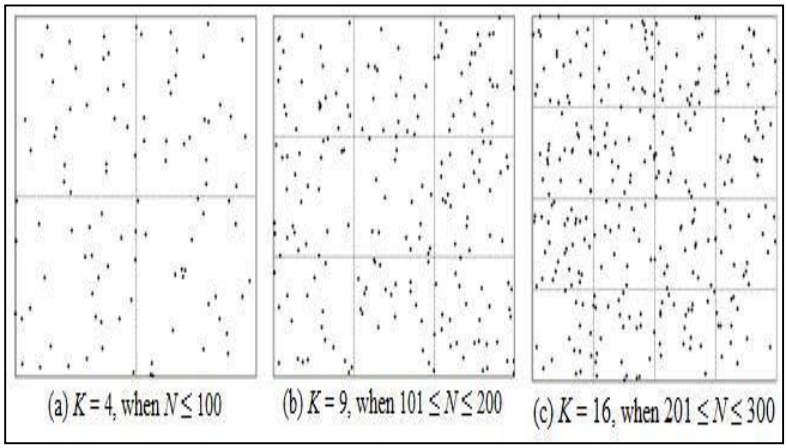

Fig. 2: Example of Different Virtual Grid Based Structures for Different Number of Nodes

III. VGDRA SCHEME

Designed a virtual infrastructure by partitioning the sensor field into a virtual grid of uniform sized cells as shown in figure 2 where the total number of cells is a function of the number of sensor nodes. A set of nodes close to centre of the cells are appointed as cell-headers which are responsible for keeping track of the latest location of the mobile sink and relieve the rest of member nodes from taking part in routes re-adjustment. Nodes other than the cell-headers associate themselves with the closest cell-headers and report the observed data to their cell-headers. Adjacent cell-headers communicate with each other via gateway nodes. The set of cell-headers nodes together with the gateway nodes constructs the virtual backbone structure.

In order to cope with dynamic network topology caused by sink mobility, nodes need to setup their facts delivery routes according with the brand new location of the cellular sink. Flooding the sink's latest vicinity to the entire sensor field is the maximum naive technique on this regard but significantly undermines the power conservation goal and is therefore avoided. the usage of our VGDRA scheme, simplest the set of mobile-headers that represent the virtual spine shape are answerable for retaining fresh routes to the contemporary place of cell sink. For periodic statistics collection from the sensor field, the mobile sink moves across the sensor field and collects statistics through the closest border-line cell-header. The closest border-line cell- header (originating cell-header) upon discovering the sink's presence, stocks this data with the relaxation of the cellular-headers in a managed manner. The VGDRA scheme defines a hard and fast of propagation guidelines so that best those mobile-headers take part in the routes re-adjustment technique that surely require to adjust their routes.

A. VGDRA Algorithm

1) Mobile Sink (MS) updates its location to the closest Cell-Header (CH).
2) The closest CH becomes Originating Cell-Header (OCH).
3) if the previous Next_Hop of OCH is not the MS

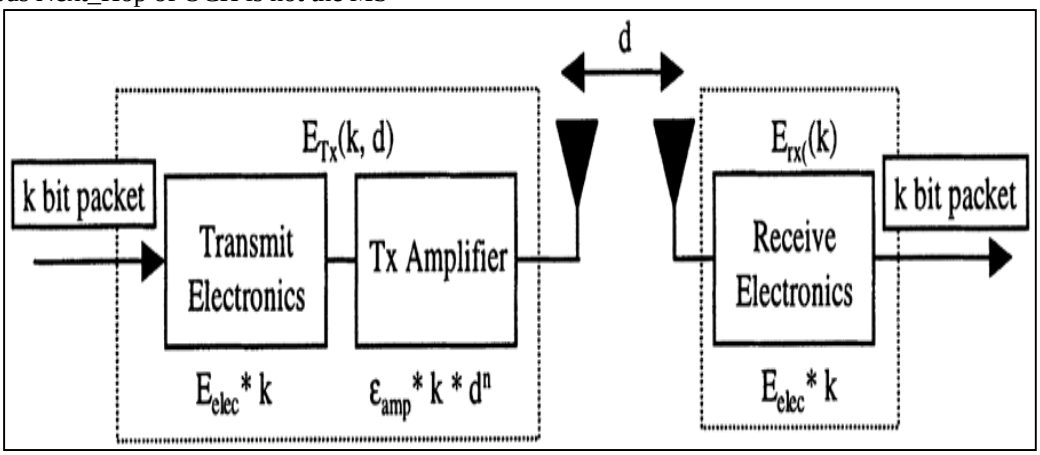

Fig. 3: Radio Energy Dissipation Model

4) {
5) set Next_Hop of OCH ← MS
6) OCH sends route update packet to the previous OCH
7) set Next_Hop of previous OCH ← OCH
8) OCH sends route update packet to its immediate

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    downstream CH
9)  for each downstream CH receives route update
    packet
10) {
11) if the previous Next_Hop of CH is not the current
    sender
12) {
13) set Next_Hop of CH ← current sender
14) if next downstream CH is not NULL
15) {
16) set sender ← current CH
17) Current CH sends route update packet to its
    immediate downstream CH
18) }
19) else
20) drop the packet
21) }
22) else
23) drop the packet
24) }
25) }
26) else
27) drop the packet
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IV. SIMULATION AND RESULT

Simulation results are presented using NS2. Varied the total number of sensor nodes from 100 to 400 which are randomly deployed in a sensor field of 200×200 dimension. A mobile sink moves around the sensor field counterclockwise and periodically broadcasts hello packets. Initially all the sensor nodes have uniform energy reserve of 1 mJ. We considered the energy model being used in [5] and assumed free space radio propagation model (d^2,d is the distance between sender and receiver). Furthermore, we considered nodes energy consumption in transmission (Tx) and receiving (Rx) modes only which are computed using Equation 1 and 2 respectively and is shown in figure 3.

$$T_x = (E_{elect} \times K) + (E_{amp} \times K \times d^2) \quad (1)$$

$$R_x = E_{elect} \times K \quad (2)$$

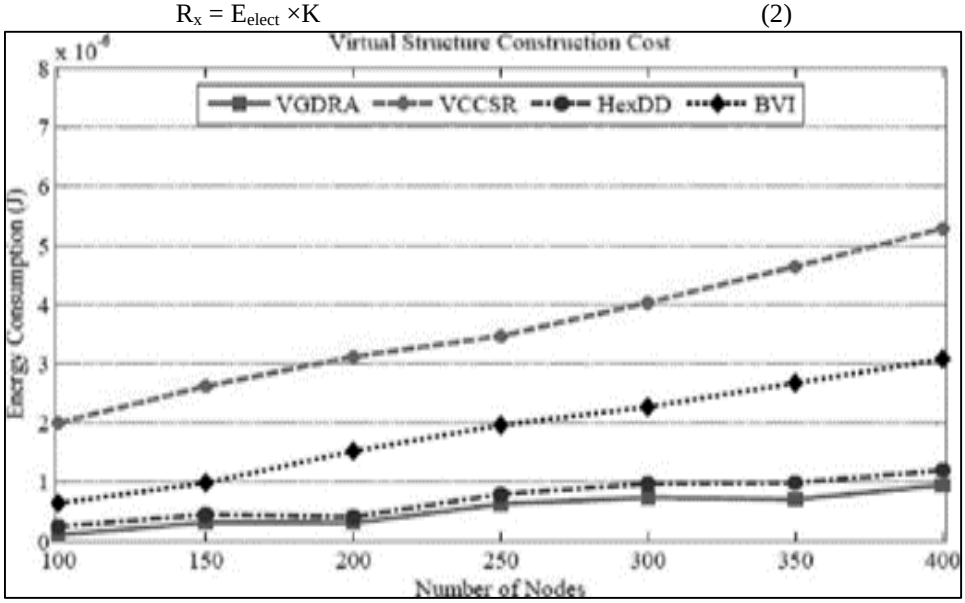

Fig. 4: Comparing Virtual Structure Construction Cost

In Equation 1 and 2, K is the message length, E_{elect} is the node's energy dissipation in order to run its radio electronic circuitry and E_{amp} is the energy dissipation by the transmitter amplifier to suppress the channel noise. In our experiment, we took E_{elect} =50 nJ, and E_{amp} =10 nJ/bit/m^2 and K =8 bits. Considered the nodes communication cost in adjusting the data delivery routes only, whereas the actual data delivery is beyond the scope of this paper. And compared the VGDRA scheme with VCCSR, HexDD, and BVI where a common feature among them is the use of a virtual infrastructure for network operation. Used four different

criteria to evaluate the performance of the VGDRA against the other schemes under the same network dynamics: virtual backbone structure construction cost, per round routes reconstruction cost, average network lifetime, and network convergence time.

A. The Virtual Backbone Construction Cost

The virtual structure construction cost is an estimate of the nodes energy consumption in electing the cell-headers and then forming the virtual backbone network. Figure 4 compares the average nodes' energy consumption of our VGDRA scheme with the other schemes in constructing the virtual backbone network for different network sizes.

As demonstrated in Figure 4, nodes using VGDRA scheme incur least cost compared to other schemes in constructing the virtual structure. The VCCSR considers fixed number of cluster-head nodes irrespective of the network size e.g., it considers 81 cluster-head nodes under the considered Network dynamics and thus as a result, a high population of the sensor nodes take part in the cluster-head election. Similarly, the BVI incurs considerable communication cost in clustering the network where all the nodes exchange residual energy level information. Compared to VCCSR and BVI, nodes using HexDD perform local processing thereby causing less communication overhead. On contrary, using our VGDRA scheme, the total number of cells and thus the cell-headers is a function of the total number of nodes e.g., the number of cell-headers varies from 4 to 16 when N varies from 100 to 400 nodes. In addition, only the nodes within short distance to the mid-point of the cell take part in cell-header election thereby reducing the communication cost.

B. The Per Round Routes Reconstruction Cost

The per round routes reconstruction cost represents the nodes energy expenditure in re-adjusting the data delivery routes as the sink moves around the sensor field and completes

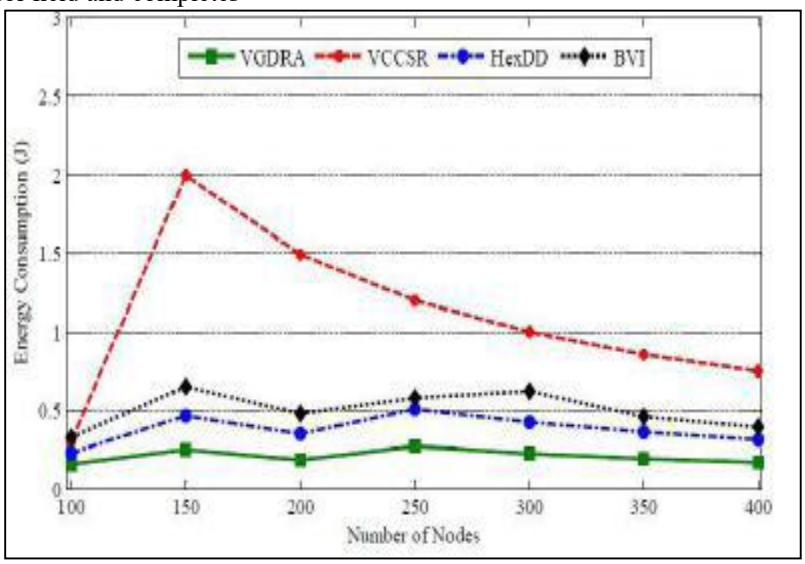

Fig. 5: Comparison of Routes Reconstruction cost

one round of the sensor field. As shown in Figure 5, using the VGDRA scheme, the average nodes' energy consumption in reconstructing the data delivery routes to the latest location of the mobile sink is significantly less compared to the other schemes. This is mainly attributed to the least propagation of sink's location updates by following the set of communication rules of the VGDRA while preserving nearly optimal routes towards the latest location of the mobile sink. Using this VGDRA scheme, only a partial sub-set of cell-header nodes takes part in the routes reconstruction process thereby reducing the overall routes reconstruction cost.

C. The Network Life Time

The network lifetime is defined as the time elapsed since the nodes deployment till the first node dies due to energy depletion. In our experiments, we estimated the network lifetime in terms of the number of rounds of the mobile sink around the sensor field till the first node in the network dies due to energy depletion. As presented in Figure 6, our VGDRA scheme outperforms the other schemes in terms of network lifetime at different network sizes. In VCCSR, the cluster-head at the central-point of the sensor field suffers from more work-load for taking part in every single reconstruction phase and thus depletes its energy much earlier compared to others. Similar behaviour is exhibited by the centre and border nodes in HexDD thereby decreasing the overall network lifetime. Unlike the VCCSR and HexDD, the proposed VGDRA and BVI schemes keep track of the residual energy of cell-header nodes and progressively elect new header nodes thereby prolonging the network lifetime. Furthermore, compared to BVI, the proposed VGDRA scheme incurs least network control overhead. The results presented in Figure 6 also demonstrates nearly uniform network lifetime at different network sizes using our VGDRA scheme which justifies the approach of partitioning the sensor field into different number of cells on the basis of the total number of nodes.

D. The Network Convergence Time

The network convergence time is an indirect reflection of the data delivery efficiency as the more promptly the nodes come to know about the latest location of a mobile sink, the more efficient routes they can select in disseminating the sensed data. It is an estimation of the elapsed time that a significant position change of the mobile sink is recorded by the nodes constituting the virtual infrastructure. In terms of

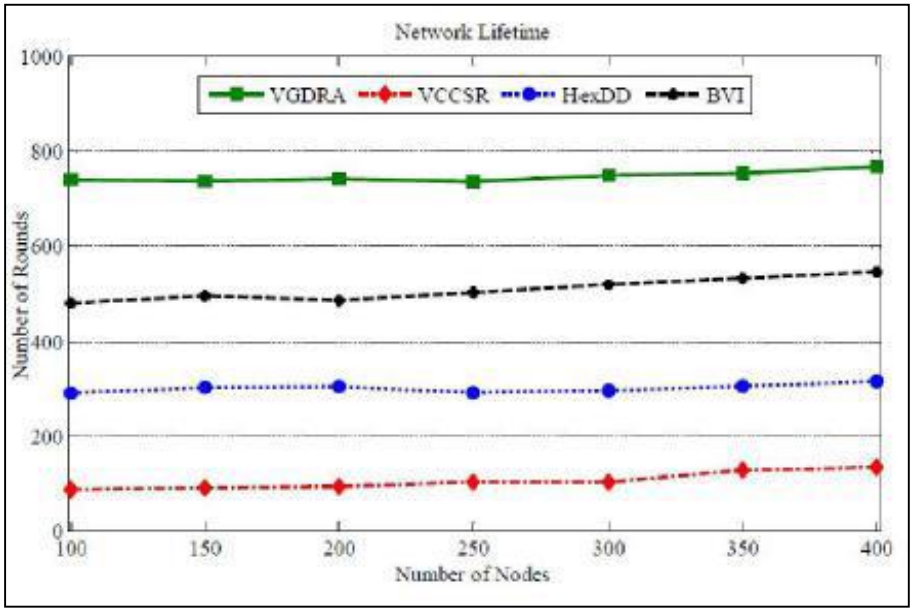

Fig. 6: Network Lifetime around the Sensor Field

convergence time, the faster the nodes converge to latest location of a mobile sink, the better they perform in data dissemination phase. The convergence time of the proposed VGDRA scheme is very fast compared to VCCSR, HexDD, and BVI when the sink is moving at a speed of 10 m/sec. Using the set of communication rules, our VGDRA scheme intelligently picks a small subset of cell-headers in the routes re-adjustment process and then greedily shares the latest location information of the mobile sink with them. This partial re-adjustment greatly reduces the network overhead and leads to faster convergence of nodes to the latest location of the mobile sink.

V. PROPOSED SYSTEM

Data masking or data obfuscation is the process of hiding original data with random characters or data. The main reason for applying masking to a data field is to protect data that is classified as personal identifiable data, personal sensitive data or commercially sensitive data, however the data must remain usable for the purposes of undertaking valid test cycles. It must also look real and appear consistent. It is more common to have masking applied to data that is represented outside of a corporate production system. In other words, where data is needed for the purpose of application development, building program extensions and conducting various test cycles. It is common practice in enterprise computing to take data from the production systems to fill the data component, required for these non-production environments.

Data involved in any data-masking or obfuscation must remain meaningful at several levels:

1) The data must remain meaningful for the application logic. For example, if elements of addresses are to be obfuscated and city and suburbs are replaced with substitute cities or suburbs, then, if within the application there is a feature that validates postcode or post code lookup, that function must still be allowed to operate without error and operate as expected. The same is also true for credit-card algorithm validation checks and Social Security Number validations.
2) The data must undergo enough changes so that it is not obvious that the masked data is from a source of production data. For example, it may be common knowledge in an organization that there are 10 senior managers all earning in excess of $300K. If a test environment of the organization's HR System also includes 10 identities in the same earning-bracket, then other information could be pieced together to reverse-engineer a real-life identity. Theoretically, if the data is obviously masked or obfuscated, then it would be reasonable for someone intending a data breach to assume that they could reverse engineer identity-data if they had some degree of knowledge of the identities in the production data-set. Accordingly, data obfuscation or masking of a data-set applies in such a manner as to ensure that identity and sensitive data records are protected - not just the individual data elements in discrete fields and tables.

Encryption is often the most complex approach to solving the data masking problem. The encryption algorithm often requires that a "key" be applied to view the data based on user rights. This often sounds like the best solution but in practice the key may then be given out to personnel without the proper rights to view the data and this then defeats the purpose of the masking

exercise. Old databases may then be copied with the original credentials of the supplied key and the same uncontrolled problem lives on.

Recently, the problem of encrypting data while preserving the properties of the entities got a recognition and newly acquired interest among the vendors and academia. New challenge gave birth to algorithms called FPE (format preserving encryption). They are based on the accepted AES algorithmic mode.

VI. MASKING ENCRYPTION

The proposed system here is adding security to the VGDRA scheme by masking encryption Method:

1) First the permutation of 8 words will carry out

Eg :

Suppose the control bit is 10011010 and data is 11101011, then the result will be 10111101.

2) After that it will under go substitution, 3 bit words

Substitution set = {0,4,6,1,5,3,7,2}

Suppose the data is 111010 , the first 3 word is 111=7, so it will substitute by 2 ie 010.

Next is 010=2 it will substitute 6=110. Then result will be 010110.

This is the encryption process.

VII. CONCLUSION

In this paper, proposed a novel Virtual Grid based Dynamic Routes Adjustment (VGDRA) scheme that incurs least communication cost while maintaining nearly optimal routes to the latest location of the mobile sink. VGDRA scheme partitions the sensor field into a virtual grid and constructs a virtual backbone structure comprised of the cell-header nodes. A mobile sink while moving around the sensor field keeps on changing its location and interacts with the closest border-line cell-header for data collection. Using a set of communication rules, only a limited number of the cell-headers take part in the routes reconstruction process thereby reducing the overall communication cost. In terms of nodes energy consumption, the simulation results reveal improved performance of our VGDRA scheme for different network sizes. Masking encryption technique is applied here for data security.

ACKNOWLEDGMENT

This field has seen tremendous developments over the last two decades, and it is not possible to include all relevant references to all the subjects that are discussed. To give a coherent coverage to such a broad field, the authors have discussed and referenced work they are most familiar with in greater detail. The author acknowledge and apologize for the many omissions that necessarily have resulted.

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