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Study on Implementation of Distributed and High Capacity Hybrid Wireless Network Using Three-hop Routing Protocol

Laxmidevi Kiransing Rajput[1], Dipak D. Bage[2]
Department Of Computer Engineering,
SSBT's College Of Engineering And Technology, North Maharashtra University,
Jalgaon, Maharashtra, India

Abstract - **Information is directed to its destination in distributed/multi-hop way in MANET along with the intermediate nodes. In HWN, finding on demand route and route support are very important factors for multi-hop routing . MANET is less reliable and appropriate for solely transmission of native data as compare to infrastructure based wireless network. In Infrastructure based Wireless Network communication is done between nodes through base stations. Infrastructure based Wireless Network gives very high data transmission rate and access power to channel, however it suffers from the drawback of upper power utilization on mobile nodes and its sole purpose of collapse. For recognizing defect node and retrieving defective node, algorithms are presented which will expand the lifetime of HWN in factors of low power utilization and improved efficiency. An important part which affects the working of wireless network in data transmission is routing protocol. In MANET whenever some of the sensor node gets crash then use of this algorithm helps in recognizing the fault node and also will exchange the same data with another high capacity node.**

Index Terms: **MANET, Hybrid Wireless Networks, DTR Algorithm, RRP Algorithm, Homomorphic Encryption Algorithm**

I . INTRODUCTION

Configuration wireless networks and MANET have an anxious astounding exploration interest, presently. To increase the wireless complex capacity for high performance applications has encouraged the maturity of hybrid wireless networks. HWN is an incorporation of two networks which are a configuration wireless network and a MANET. Smart-phones, PDAs, tablets and laptops these are wireless devices and have a configuration interface as well as an ad-hoc interface. A hybrid communication setup will be predominantly used in the about to future, as the volume of such consultation has been extend snappily in recent years,. Such setups combine the constitutional reimburse and dissolve the disadvantages of the configuration wireless networks and MANET. Information is disperse to its destination along with the middle nodes in a multi-hop form in a MANET. On-requisition route detection or route conservation are essential in multi-hop routing. MANET are not as defensible as configuration wireless networks because of the information is carried through the wireless channels and along with the vital routing ways. MANET's are only good for divisional region data transmission by reason of multi-hop transmission.

In wireless communication, the configuration wireless network (e.g. cellular network) is the critical means of occurring every day . The inter-cell communication and the use of Internet is best with the cellular network. It makes achievable the support of universal network connectivity and wide-ranging computing by incorporating all kinds of wireless devices into the network. The Node exchange information with each other with the help of the base stations (BSes), in the configuration network. The infrastructure wireless networks can provide higher message transmission responsibility and channel access effectiveness within the long distance one-hop transmission between BSes and mobile nodes, but suffer from higher power expenditure on mobile nodes and the single point of abortion problem.

A hybrid wireless network(HWN)[1] amalgamate the countenance of an infrastructure(configuration) wireless network and a MANET network to influence their advantages and defeat their shortcomings, and assuredly boost the throughput volume of a broad wireless network. The throughput capacity in data transmission is change by a routing protocol which is a analytical element in wireless network. In the most currently used routing protocols of HWN amalgamate the cellular transmission mode in configuration wireless networks and the ad-hoc transmission mode in MANET . In HWN, to transfer a information to the mobile gateway nodes that are along toward to the BSes or have the maximal bandwidth to the BSes, the multi-hop routing protocol is used. Using high frequency of a channel, the maximum throughput can be accomplished. The mobile gateway nodes then transfer the information to the BSes, these gateway nodes operate as bridges to attach the ad-hoc network and the configuration network. Absolute aggregation of these two transmission modes acquire the following flaws that are rooted in the ad-hoc: - Low reliability, aggressive and lengthy routing ways advance to deceptive routing. The reason of the eminent data drop rate is Noise intervention and neighbor intervention at the time of multi-hop transmission process. Lengthy routing paths access the chances of the abnormality of path failure because of the highly aggressive attribute of MANET.

In HWN the above mentioned flaws are become a barrier in achieving eminent throughput and scalability. Taking into consideration of the broadly spread BSes, the mobile nodes have higher chances of experience a BS while moving. Taking advantage of this attribute, we propose a Distributed, secured and High capacity Three-hop Data Routing protocol (DHTR). In DHTR, a source node split information streamlet into a number of fragments. Each fragment is transfer to a neighbor mobile node. Mobile relay nodes will select between direct communication or relay communication to the BS rely on the QoS necessity. In Relay transmission, a fragment is ahead to another mobile node with greater capacity to a BS than the general node. A segment is directly ahead to a BS in direct transmission. In the configuration network, the fragments are reorganizing in their original order and forward to the end station. In DHTR, the number of routing hops is constrain to three, including not more than two hops in the ad-hoc transmission mode and single hop in the infrastructure transmission mode. To beaten the above mentioned deficiencies , DHTR attempt to limit the number of hops. In DHTR, the first hop forwarding, dispense the fragments of an information in different ways to completely use of the resources, and the second hop forwarding assures the high capacity of the forwarder. To avoid the traffic congestion at BSes DHTR has a congestion control algorithm to fairness the traffic load between the accessible BSes. Using self-adaptive and distributed routing with high speed and short path ad-hoc transmission, DHTR considerably boost the throughput capacity and scalability of HWN by defeating the three deficiencies of the previous routing algorithms.
It has the following features:

- Low overhead. In the ad-hoc transmission mode, especially in a dynamic environment, it eliminates overhead caused by route discovery and maintenance.
- Hot spot reduction. While makes full use of channel resources through a distributed multi-path relay, it reduces traffic congestion at mobile gateway nodes.
- High reliability. Since of its tiny hop path length with a small physical distance in each step, it mitigate noise and neighbor intervention and prevent the unfavorable effect of route crackup during data transmission. Thus, it reduces the packet drop rate and makes full use of special reuse, in which several source and destination nodes can communicate simultaneously without interference.

Thus the algorithm access the life span of the HWN a limits the impacts take place due to the faulted node.

II. RELATED WORK

Ucan: A Unified Cell and Ad-hoc Network architecture [2]: Unified cellular and specification to extend the outturn of cells are described in this paper. A mobile user has 3G cellular link and IEEE 802.11 based mostly peer to see links. The 3G cellular base stations forwards fragments to end station with low channel quality in the direction of proxy shoppers. The proxy shoppers use multi-hop unforeseen network created of different mobile nodes and IEEE 802.11 wireless links to forward the fragments to the end station. This paper presents secure packet transfer for sustitute nodes, in depth imitation with IEEE 802.11(b). They tend to show that the UCAN design will offers separate user's output by up to eightieth and also the mixture outturn of downlink by up to hr.

Multi-hop cellular: This is new architecture for wireless communications [3]. This paper presents a substitution blueprint for wireless communication that is anticipation as Multi-hop Cellular Network (MCN). MCN preserve the skill of typical single-hop cellular network (SCN), wherever the service configuration is depict by fix bases, wherever wireless transmission along with mobile nodes in Multi-Hops area element allowed. The MCN is used for decreasing the required diversity of bases to improve the overall performance

whereas limiting path tackle in ad-hoc networks. SCN and MCN area are investigate the term of mean hop count, hop by hop turnout and finish turnout, and mean diversity of channels besides completely different.

Connectivity in ad hoc and hybrid networks [4]. This paper shows the introduces dispersed arrangement of abject base which eloquently advice in access the connectivity, but it alone if the bulge body is abundant added in one ambit than in the other. They use aperture approach to explain the results. This cardboard obtains analysis of prononcement of connectivity in the 1-dimension case.[16] They as well appearance that aqueduct are certain at a beneath spatial body of nodes and after-effects acquired on absolute citizenry abstracts affirm our finding.

Highly Dynamic Destination Sequenced Distance Vector routing (DSDV)[5]. This paper represents a new adjustment for the operation of ad-hoc network. The radical addition of the adjustment is to administer every adaptable protrude as an appropriate router, which assuredly broadcasting its angle of the alternation cartography with added adaptable nodes aural the networks. They call the means to reconstruct the arrangement band acquisition and to accommodate MAC band abutment for Ad-hoc networks.

Ad-hoc On Demand Distance Vector (AODV) routing[6]. AODV algorithm is used for the Ad-hoc Network's operation, every adaptable swelling works as an appropriate router, and routes are acquired on appeal with no assertion on advertisements their new acquisition algorithm is added aces for an activating aggressive network, as appropriate by users adulatory to advance ad-hoc networks. AODV provides bend routes and aliment torn links. We can bottle the allowances of basal ambit agent acquisition mechanisms in network. They states that this algorithm measures beyond populations of adaptable hosts to anatomy Ad-hoc networks.

Distributed reactive routing protocol for Hybrid Wireless Networks based on QOS:
As wireless communication acquiring popularity now a days, convincing research has been committed to supporting real-time transmission with severe Quality of Service (QOS) requirements for wireless applications. Parallally, a wireless hybrid network(HWN) that entertain a mobile wireless ad hoc network (MANET) and a wireless configuration network has been establish facts to be a better substitute for the next generation wireless networks. By equating resource reservation-based QOS routing for MANETs, HWN be conceive invalid reservation and race condition problems in MANETs. This paper, present a QOS-Oriented Distributed routing protocol (QOD) to make powerful the QOS support adequacy of HWN. Taking advantage of less transmission hops and any-cast transmission features of the HWNs, QOD change completely the packet routing problem to a resource scheduling problem. QOD consists of five algorithms: 1)a QOS-guaranteed neighbor selection algorithm to record the transmission delay requirement, 2) a distributed packet scheduling algorithm to reduce transmission delay, 3) a mobility-based fragment resizing algorithm which helps to accommodate fragment size in as per node mobility also reduce transmission time, 4) a traffic redundant elimination algorithm in order to enlarge the transmission throughput, and 5) a data redundancy elimination-based transmission algorithm to remove the duplicate data for enhancing the transmission QOS. Logical and imitation QOD protocol give high QOS fulfillment in terms of overhead, transmission deferment, mobility-resilience, and scalability.

Highly reconciling distributed routing algorithm for mobile ad-hoc networks:
New distributed routing protocol for mobile, multi-hop, wireless networks is presents in this paper. The protocol is one of a family of protocols which we term "link reversal" algorithms. The protocol's response is organize as a temporally-ordered sequence of diffusing computations; each computation consisting of a sequence of directed link reversals. This protocol is highly adaptive, well organized(efficient) and ascendable; being best-suited for use in large, heavy, mobile networks. In such type of networks, the protocol's response to link failures typically involves only a localized "single pass" of the distributed algorithm. This adequacy is isolated among protocols which are resistant in the face of network distribution, and results in the protocol's eminent amount of adaptivity . This seductive behavior is accomplished through the original use of a "physical or logical clock" to set up the "temporal order" of topological change events which is used to form (or order) the algorithm's response to topological changes.

On the Capacity of Hybrid Wireless Networks:
A hybrid network is organized by placing a scattered network of base stations in an ad hoc network. These base stations are assumed to be connected by a high-bandwidth wired network and act as relays for wireless nodes. They are not data sources or data receivers. Hybrid network dispense a accomodation between traditional cellular networks and pure ad hoc networks in that data may be furthermore forwarded in a multi-hop fashion or through the infrastructure. It has been shown that the capacity of a random ad hoc network does not scale well with the number of nodes in the system. In this work, we consider two different routing strategies and study the go up behavior of the throughput capacity of a hybrid network. Analytical expressions of the throughput capacity are obtained. For a hybrid network of n nodes and m base stations, the results show that if m grows asymptotically slower than $\sqrt{n}$, the benefit of adding base stations on capacity is insignificant. Neverthless, if m grow faster than $\sqrt{n}$, the throughput capacity enlarge uniformly with the number of base stations, providing an constructive improvement over a pure ad hoc network. Therefore, in order to

reach non-imperceptible capacity gain, the investment in the wired infrastructure should be high enough. This protocol not support for adhoc networks. In future hybrid protocol support for adhoc networks.

Two-Hop Routing Protocol:

The Two-hop routing protocol work as the node communication happens within a single cell. It takes only an isolated path communication. In this, source node choose the neighbor node, the neighbor node have high frequency than to source node otherwise the neighbor node have low frequency means source node directly send message to the base station. The source node conformably select direct transmission (directly sends packets to the AP) and forward transmission (sends packets along with a forwarding node) to transmit packets to APs in Two-hop communication. As Two-hop and QOD only have two hops in the routing paths to APs, the short paths have beneath probability to malfunction. Even if a link collapses, the source node can speedily select another forwarder. Accordingly, node mobility does not considerably influence these two-hop protocols. Two-hop only deal with node frequency in packet forwarding rather than buffer utilization, it may be affected severe buffer clogging in the selected node with high frequency. Due to its tiny path, mobility adaptable in Two-hop. Two-hop also moderately reduces as the node mobility expand. This happens because faster movability leads to higher recurrence of link breakdown and hence more dropped packets quickly. Two-hop overhead mostly ensued from channel information interchange for the dynamic packet forwarding and path restore overhead. Two-hop only concerns about channel condition for the packet routing and avoid the buffer utilization, making high-bandwidth nodes effortlessly crowded. In Two-hop, the packets are always transfers to the nodes with higher transmission link rate. Without any buffer management strategy, the nodes with higher transmission links are very easily overloaded as the workload in the system increases. Two-hop consistently accredit the source node transfer the packets to the following hop node with high link rate without any resource.

III. PROPOSED APPROACH

•*Architecture*

Assumption and Overview

Since BSes are coupled with a wired strength of character, it shows that there are no bandwidth and power limitation on broadcast flanked by BSes. Relay nodes that function as gateways are used as transitional nodes, in regard to an infrastructure wireless set of connections and a mobile ad-hoc arrangement. Every transportable node is dual-mode; that is; it has ad-hoc network interface such as a WLAN radio interface and infrastructure network interface such as a 3G cellular interface.

The main goal of DHTR is to reduce the routing burden from the ad-hoc network to the infrastructure network by taking advantage of widespread base stations in a hybrid wireless network. Instead of using one multi-hop path to send a message to a BS, DHTR uses at most three hops to send a message as segments to different BSes in a distributed manner. It divides the message into several segments whenever a source node wants to send a message and transmits each segment along its neighbor node based on the Quality of Service (QoS) requirement of the application. These segments are besides forward by the neighbor nodes in a distributed manner to nearby BSes. The final BS rearranges all the segments into the original and sends the message to the destination. In DHTR, the data routing process is divided into two steps: Uplink data routing is defined to uplink the data from the source node to the first base station and forward the message to the final base station. Downlink data routing and data reconstruction is defined to downlink the data from the final base station and rearrange the message segments in the right order so that a destination node receives the correct data.

Uplink Data Routing

A lengthened direction-discovery path will exhibits the way to eminent overhead, hot spots and low dependability. Hence, DHTR tries to limit the path breadth. It adopts one hop to transfer the section of information in a distributed way and adopts the other hop to discover high-capacity forwarder for eminent accomplishment routing. Appropriately, DHTR confine the path span of uplink direction-discovery to two hops in order to prevent the annoyance of long-path multi-hop direction discovery in the ad-hoc group of associations. In the uplink routing, a source node at first fractionate the information stream into a number of fragments, then broadcast the fragments to its nearby nodes. The nearby nodes transfer fragments to BSes that is base stations, which will transfer the fragment to the BS where the end node resides. When a source node transmit the information fragments, it selects the nearby node which has plenty scope for accumulating a fragment and then selects the nearby nodes that have the highest capacity. When choosing a neighbor node for data transmission, a node needs the capacity information (i.e., queue size and bandwidth) of its neighbor nodes.

Downlink Data Routing and Data Reconstruction

As stated above, the information stream of a source node is partitioned into several fragments. Ensuing to a BS take liberation of a fragment, it compulsion to forward the fragment to the BS, where the destination nodes resides. To assign BSes, moveable IP is used

to be accustom with the destination BS. In this process, each transferable node is related with a residence BS, which is the BS in the node's home network not allow for of its existing location in the network. The home network of a node accommodate the registration information recognized by its home address, which is a static IP address accredited by an ISP. When a mobile node change from its home BS, the BS where mi presently exist in, detects mi and forward the IP address to the home BS of mi. When a BS wants to contact mi, it contacts the home BS of mi, to find the current location where the mi resides at. For occurrence, data is transmitting to BS Bi that has the data's target, but the destination has moved to the choice of BS Bj before the data reach the destination at BS Bi. In the direction of deal with this trouble, we espouse the Cellular IP protocol for footpath node position. With this set of rules, a BS has a home agent and a foreign agent.

The foreign agents keep track of movable nodes moving into the other BSes. The home agent interrupts received segments, reconstructs the original data, and re-routes it to the foreign agent, which then frontwards the data to the target movable node.
Subsequent to the target BS takes delivery of the segments of a communication, it reschedules the subdivision into the unique communication and then throws it to the target mobile node. A vital issue is guaranteeing that the subdivision is collective in the accurate order. For this purpose, DHTR indicates the subdivision arrangement format.
Each subdivision includes eight fields, followed by:
(1) Source IP address (denoted by S);
(2) Destination IP address (denoted by D);
(3) Message sequenced number (denoted by m);
(4) Segment sequenced number (denoted by s); (5) QoS indication number (denoted by q);
(6) Data;
(7) Length of data; and
(8) Checksum.
Fields (1)-(5) are in the segment head.

The source IP address is to inform the destination node where the message comes from. The destination IP address is used to denotes the destination node, and is also used to denote the final BS. The message sequence number differentiates the different messages initiated by the same source node. The segment sequence number is use d to reorder the segmented message to the original message in the destination node. The 'Data' is the real message that the source node wants to send to the destination node. The length field indicates the length of the DHTR segment including the header in bytes. The checksum is used by the receiver node to check whether the received message has any errors. To indicate the QoS requirement of the application, QoS indication number is used. Thus, each segment's head includes the information represented by (S, D, m, s, q) (m, s=1, 2, 3…). Once all the segments received at the destination node it transpose the segments to recover the original message.

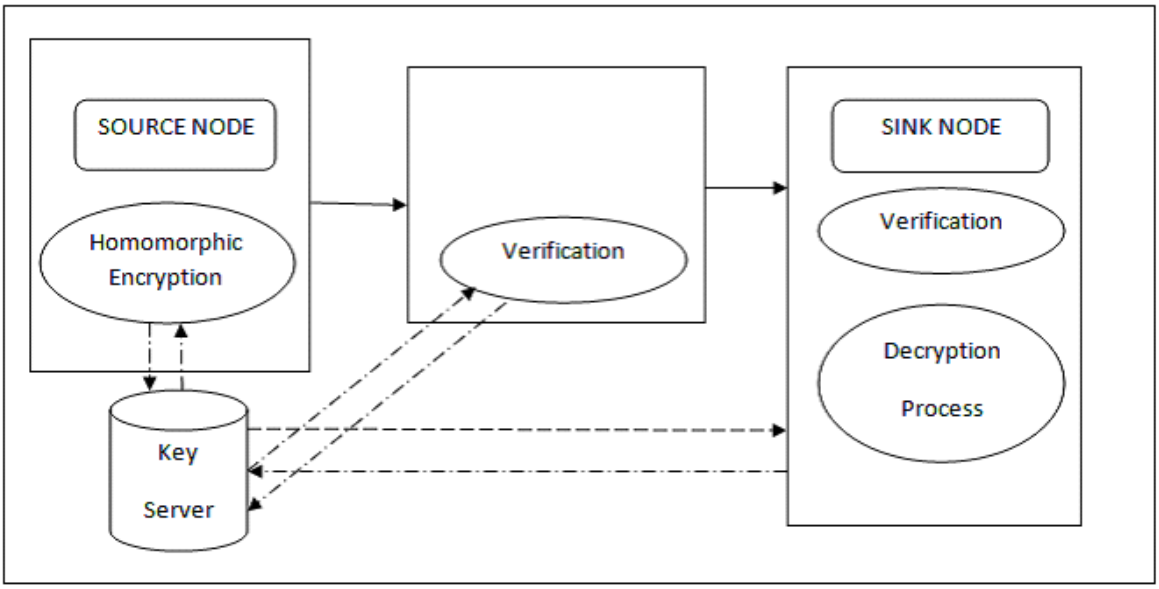

Fig 1: Proposed System Architecture

Hybrid wireless networks are accepting formation absorption in current years. An union wireless protocol accumulation Associate in Nursing basement wireless arrangement and a adaptable ad-hoc arrangement leverages their blessings to extend the aftermath adequacy of the system. However, accepted amalgam wireless networks alone mix theacquisition protocols aural the two forms of networks for ability transmission, that prevents them from accomplishing college arrangement adequacy during this paper, we tend to adduce a Distributed Three-hop Acquisition (DHTR) ability acquisition agreement that integrates the accompanying options of amalgam wireless networks aural the ability manual method. In DHTR, a accumulation bulge divides a bulletin beck into segments and transmits them to its adaptable neighbours that added advanced the segments to their destination through Associate in nursing basement network. DHTR banned the acquisition aisle breadth to a few, and continuously arranges for high-capacity nodes to advanced ability not like a lot of absolute acquisition protocols, DHTR produces decidedly lower aerial by eliminating avenue assay and maintenance. Additionally, its appropriate characteristics of abbreviate aisle length, short- ambit transmission, and counterbalanced amount administration accord top acquisition assurance and efficiency. DHTR additionally encompasses a bottleneck administration algebraic affairs to abstain amount bottleneck in BSes in the case of asymmetric trace distributions in networks. Theoretical assay and simulation after-effects appearance that DHTR will badly advance the aftermath adequacy and quantifiability of amalgam wireless networks attributable to its top quantifiability, efficiency, and assurance and low overhead.

We proposed an augmentation and backup algorithm which is a aggregate of a biogenetic algorithm and brand circulation algorithm. In this cardboard proposes an algorithm augmentation and backup algorithm that increases the backbone if sensors nodes are suspension i.e. sensor nodes do not accept array ability and sensors. If activity time recess their alternative beginning amount RRA algorithm alter those sensor nodes acclimated the reused acquisition paths but not alone backup is as well reduced. Improves the wireless sensor arrangement lifetime and moderate the sensor bulge drained cost.

This paper proposes RRP algorithm on brand circulation algorithm incorporate with the a biogenetic algorithm for reestablishing the sensor nodes if some of the sensor nodes are shutdown. This algorithm can grant the adolescence of replacing sensor nodes and as well added acclimated acquisition paths called as RRP. This algorithm generates the genre amount and acquisition table, a set of associate nodes and burden amount anniversary sensor node. The bulge displacement the reside abstracts to the bore bulge according to the brand circulation algorithm if accident occurs actuality finds the Bth value. Bth amount beyond than the RRP algorithm will be conjured; reinstate the asleep bulge by the best exercise nodes that is generated by abiogenetic algorithm application the some operations to reinstate the sensor nodes.

•*Algorithm*

1. Distributed and High CapacityThree-Hop Routing Protocol (DHTR Algorithm)

Step 1: The source node divides the message into several segments.
Step 2: Source node contribute to the subdivision to the close to (first) Base Station.
Step 3: Succeeding to a Base station take delivery of the subdivision needs to onwards to the target node.
Step 4: DHTR choose the neighbor node based on the Capacity (each node periodically exchanges their capacity level).
Step 5: The neighbor node broadcast the subdivision to Final Base station (near for Destination).
As the messages are broadcast in wireless channels and through lively routing paths, mobile ad-hoc networks are not as trusty as transportation wireless networks. Furthermore, for the reason that of the multi-hop communication features, mobile ad-hoc networks are only appropriate for local area data transmission.
In DHTR, a starting place node divides a message torrent into a quantity of segments. Each subdivision is sent to a neighbor portable node. Based on the QoS requirement, these transportable relay nodes choose between direct transmissions or relay broadcast to the BS. In relay broadcast, a section is onwards to an additional mobile node with higher capacity to a BS than the current node.

2. Register Mechanism Routing Protocol (RRP Algorithm)

Step 1: Start the task.
Step 2: Identify the source and destination nodes and their ID's.
Step 3: Choose a trustworthy path from Neighbor Information Table (NIT).
Step 4: Start Send encrypted data to destination from source.
Step 5: NIT is monitor the running task achieved properly.
Step 6: If it is a failure occurs, then NIT will change the path as shortest to destination.
Step 7: Data could be retransmitted nearby failure node in alternative path chosen by NIT to destination.
Each antenna node in the arrangement will swap over information concerning its own environmental address and the status of power supply with one a different, save all applicable information, and set up a Neighbor Information Table (NIT), which will after that be

utilized for future operations, such as the collection of c luster head nodes and data distribution, in the initialization stage of the network.

3. ***Homomorphic Encryption Algorithm***

Homomorphic Encryption Algorithm works as follows:

i) KeyGen: Let λ be a security parameter that outputs Secret key S_k and public key P_k.

ii) Encryption: The input is given as plaintext $\pi \in \{0,1\}$ and Pk. Then the cipher text φ

iii) Decryption: Using the ciphertext φ and secret key Sk, returns plaintext π .

iv) Steps: Based on t-input circuit C and tuple of cipher texts, the modulo operation executes and returns the Ciphertext φ .

IV. CONCLUSION

This paper proposed an efficient secure distributed homomorphic encryption algorithm that addresses some issues specific to Hybrid wireless networks which are communication delay, cost, mobility, and link unreliability. Nodes fasten the details about the forwarding nodes in the packet header. This also creates a virtual node for effective data transmission. The system implements an appropriate scheme which is named as Homomorphic Encryption Algorithm for mobility analysis during transmission. This helps to find closest neighbor already in the group therefore reducing the cost of join requests broadcast and reducing the communication and computation cost incurred by the source. The concentration on selective congestion attacks by applying effective traffic and node monitoring techniques. The priority based traffic allocation with effective technique will be considered more in future.

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