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OPTIMAL DATA DISTRIBUTION OVER HYBRID CELLULAR AND AD HOC NETWORK

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ABSTRACT

Data dissemination is a major issues to mobile users using a hybrid cellular and ad hoc network. In particular, there is a problem of optimally choosing the mobile devices that will serve as access gateways in hybrid cellular and ad hoc network. For distributing the data a localization algorithm is developed in order to optimize the problem. In the proposed system, a novel data distribution scheme has been developed for mobile terminals which is utilized in cellular communities. In suggested method a file of data is distributed to a node and from there on it is communicated with neighbor nodes, in order to lower the usage of cellular network. In this system, each user equipment may be either fixed or mobile. Relay nodes access one to another through nodes and access point. Thus each user downloads the packets or shares with one to another. Server also monitors each user activities through access point and nodes. In the modification process, a handoff technique is implementing for effective communication, in order to reduce packet loss and efficient data access by using localization algorithm.

***Keywords*: Wireless Networks, Video Streaming, Quality Optimization, Resource Allocation**

I INTRODUCTION

A wireless network is a collection of nodes organized into a cooperative network. Each node consists of processing capability (one or more microcontrollers, CPUs or DSP chips), may contain multiple types of memory (program, data and flash memories), have a RF transceiver (usually with a single Omni-directional antenna), have a power source (e.g., batteries and solar cells), and accommodate various actuators [1]. The nodes communicate wirelessly and often self-organize after being deployed in an ad hoc fashion. Systems of 1000s or even 10,000 nodes are anticipated. Such systems can revolutionize the way we live and work. Currently, wireless networks are beginning to be deployed at an accelerated pace. It is not unreasonable to expect that in 10-15 years that the world will be covered with wireless networks with access to them via the Internet. This can be considered as the Internet becoming a physical network. This new technology is exciting with unlimited potential for numerous application areas including environmental, medical, military, transportation, entertainment, crisis management, homeland defense, and smart spaces.

Wireless network usually refers to a wireless local area network (WLAN). A WLAN connects computers together through radio technology using standard network rules or protocols, but without the use of cabling to connect the computers together. A WLAN can be installed as the sole network in a school or building [2]. However, it can also be used to extend an existing wired network to areas where wiring would be too difficult or too expensive to implement, or to areas located away from the main network or building. The most obvious difference between wireless and wired networks, therefore, is that the latter uses some form of cable to connect computers together. A wireless network does not need cable to form a physical connection between computers. Wireless networks can be configured to provide the same network functionality as wired networks, ranging from simple peer-to-peer configurations to large-scale infrastructures accommodating hundreds of users. There are certain parallels between the equipment used to build a WLAN and that used in a traditional wired LAN. Both networks require a network interface card (NIC) that is either built-in to or added to a handheld, laptop or desktop computer. There are two main types of plug-in card available: 1) PCMCIA which is inserted into the relevant slot in the side of a laptop and PCI which is inserted into one of the internal slots in a desktop computer. 2) Wireless NICs contain an in-built antenna to connect with the network. In a wireless network, an 'access point' (AP) has a similar function to the switch in wired networks. It broadcasts and receives signals to and from the surrounding computers via their wireless NICs. It is also the point where a wireless network can be connected into an existing wired network.

II OPTIMAL DATA DISTRIBUTION IN HYBRID NETWORKS

The aim of the project is to examine the delay, packet loss and provide efficient data access anywhere in wireless network. We are also implementing a handoff process for effective communication and avoid congestion.Mobile devices such as smart phones and tablets are increasing and continue to generate the high amount of mobile data traffic. From Fig 4.1 it consists of one or more base stations and multiple mobile devices equipped with network interfaces. The nodes communicate wirelessly and often self organize after being deployed in an ad hoc fashion. Therefore, cellular networks are not suitable for large scale data distribution. Mobile devices not only connect to the base station but also to the cellular network and also form an ad hoc network using short-range wireless protocols such as Wi-Fi and Bluetooth. Mobile devices relay data traffic amongst each other using ad hoc links, leveraging a free spectrum to alleviate bandwidth bottle necks and pull down the expense of cellular service providers [1]. We denote mobile devices that directly receive the data over the hybrid cellular network and relay the receiving data to other mobile devices over the ad hoc network as access gate ways. It is observed that although we do not consider centralized access points in the short-range network, our formation and solutions are enough, and can be readily

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applied to Wi-Fi and Bluetooth access points. Disseminating data over a hybrid cellular and Ad hoc network is not easy, because sending of data must adhere to timing constraints inherent in the delivery of the content. Traditionally, data servers use computationally complex trans-coders to reduce the data coding rates to guarantee on time delivery of data. However, in a hybrid network, real-time trans-coding is not achievable on resource constrained mobile devices. However, in a hybrid network, real time trans-coding is not feasible on resource constrained mobile devices. To deliver the highest possible data quality, we study an optimization problem that resolves: 1) mobile devices that serve as gateways and relay data from the cellular network to the ad hoc network, 2) the multi hop ad hoc routes for disseminating data, and 3) the subsets of data each mobile device relays to the next hops under sufficient constraints. Lastly, a real time data dissemination system is built which comprises of multiple Android smart-phones over a cellular network. This system was exhaustively tested. By conducting Experiments, we demonstrate the practicality and efficiency of the proposed Localization algorithm.

For optimizing the data distribution adhoc network protocol have to be used that is AODC protocol.

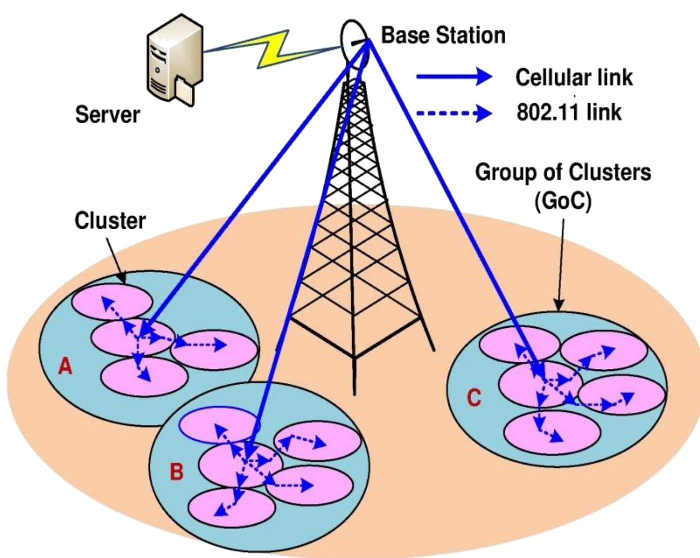

Fig1: Shows That the Block Diagram of a Hybrid Cellular and Network Links

2.1 AD HOC Network Protocol

An ad hoc network is a collection of mobile nodes forming a temporary network without the aid of any centralized administration or standard support services regularly available on conventional networks. In this paper, it is assumed the mobile hosts use wireless RF transceivers as their network interface, although many of the same principles will apply to infra-red and wire based networks. Some form of routing protocol is necessary in these ad hoc networks since two hosts wishing to exchange packets may not be able to communicate directly. For example, Fig 2 illustrates an ad hoc network with three wireless mobile hosts. Node 3 is not within the range of node 1's wireless transmitter (indicated by the circle around node 1) and vice versa. If node 1 and node 3 wish to exchange packets, they must enlist the services of node 2 to forward packets for them, since node 2 is within the range overlap between node 1 and node 3.

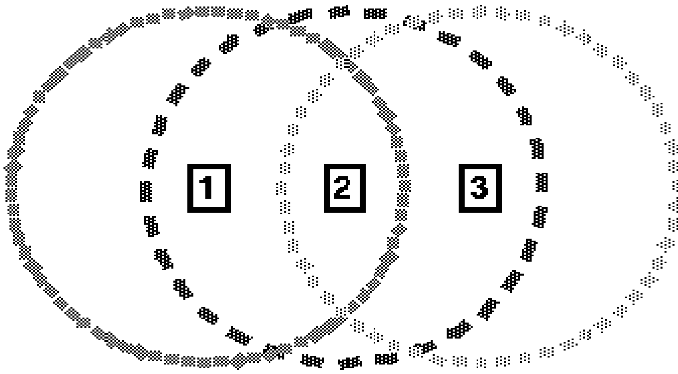

Fig 4.2 Ad hoc network with four wireless nodes.

Another situation unique to wireless networks is illustrated in Fig3. In this example, node 1 has a large enough range to transmit packets directly to node 3. However, node 3 has a much smaller range and must enlist the help of node 2 in order to return packets to node 1. This makes the link between node 1 and node 3 appear as one-way or unidirectional link. Most conventional routing protocols require bidirectional links.

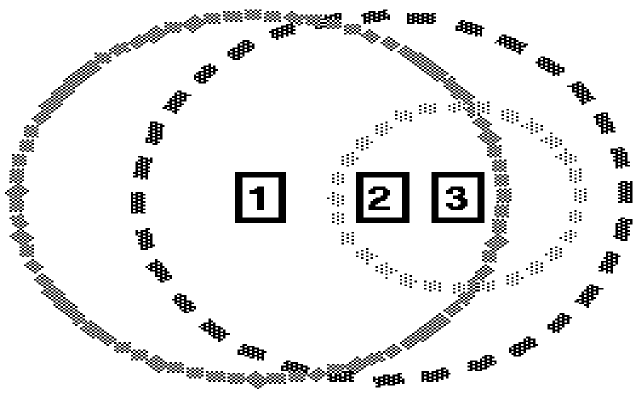

Fig 3 Ad hoc network with a one-way link

Another problem with wireless network interfaces is they typically operate at significantly slower bit rates than their wire-based counterparts. Frequent flooding of packets throughout the network, a mechanism many protocols require, can consume significant portions of the available network bandwidth. Ad hoc routing protocols must minimize

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bandwidth overhead at the same time as they enable proper routing to take place. Finally, ad hoc networks must deal with frequent changes in topology. By their very nature, mobile nodes tend to "wander around", changing their network location and link status on a regular basis. Furthermore, new nodes may unexpectedly join the network or existing nodes may leave or be turned off. Ad hoc routing protocols must minimize the time required to converge after these topology changes. A low convergence time is more critical in ad hoc networks because temporary routing loops can result in packets being transmitted in circles, further consuming valuable bandwidth.

2.2 Proposed Data Distribution Network

From Fig 4 it shows the proposed data distribution network diagram that the system has been developed to reduce the propagation delay, packet loss and efficient data access by implementing handoff process in wireless network. Each node consists of processing capability (one or more microcontrollers, CPUs or DSP chips), may contain multiple types of memory (program, data and flash memories), have a RF transceiver (usually with a single Omni-directional antenna), have a power source (e.g., batteries and solar cells), and accommodate various actuators. The nodes communicate wirelessly and often self-organize after being deployed in an ad hoc fashion. In this article, we discuss the potential advantages as well as the implementation challenges of deploying MRNs. Compared to analog repeaters, advanced relay nodes (RNs) that can be decode and forward data to UE. They can also detect or correct errors before forwarding the data to UE.

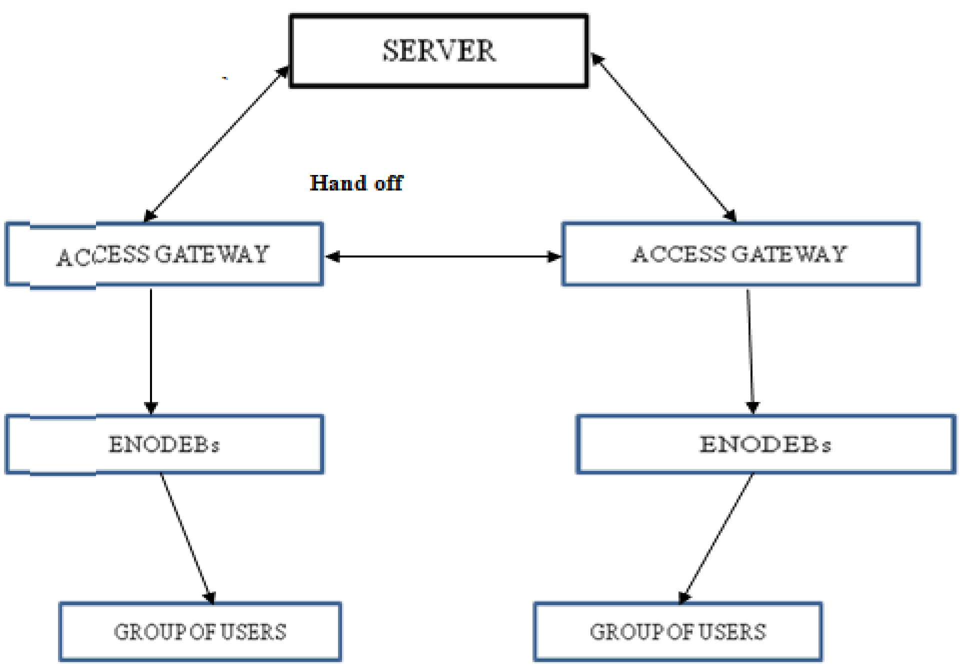

Fig4 Proposed data Distribution network diagram

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Type 2 RNs are transparent RNs that replicate the cell ID of their donor eNBs. 2 The FRN, which has been standardized in the LTE Advanced system, is an in band half-duplex decode-and-forward (DF) type 1 RN, while the use of other types of RNs in wireless networks has been left for further investigation [5, Ch. 30]. Measurements show that the VPL can be as high as 25 dB in a minivan at the frequency of 2.4 GHz, and higher VPLs are foreseeable in the vehicles of interest [9]. Last but not least, compared to direct transmission from eNBs to in-vehicle UE, better propagation conditions less shadowing and path loss, and higher line-of-sight (LOS) connection probabilities can be expected for the backhaul connections between eNBs and MRNs. Moreover, MRNs can be shared by several operators, a fact that can lower the cost of building the networks. Besides using MRNs, several other solutions using existing techniques have also been proposed in 3GPP to serve vehicular UE. In this article, we first review the solutions based on the existing techniques to serve vehicular UE. Then we present the benefits of using dedicatedly deployed MRNs to serve UE inside public transportation vehicles. Simulation results show that MRNs can effectively serve vehicular UE. At the end of the article, we discuss the challenges and open issues as well as future research directions toward applying MRNs to practical communication systems.

III. LOCALIZATION ALGORITHM

The proposed methodology is based on the following three steps: 1) an error functions measuring the overall relative angle errors of all the nodes in the network is defined. 2)an optimization method to decrease the error Function is then applied. 3) a smart dissemination algorithm for each node in the network is applied in such a way that the cooperative behavior implements the optimization method. We assume here that the network consists of n nodes. Let pi= (xi, yi) be the position of the ith node in a two dimensional space. We assume that a node iknowsthe angle αjik that it forms with each pair of neighbors j; k. Let Ri be the transmission range of a node i, we define the set of neighbors N(i)as the set of all the nodes within the transmission range Ri of i. Note that we do not assume that the transmission range is the same for each node. Steps involved in this project by using localization algorithm in Ns2.5 version software. Steps involved for programming in Ns2.5 version

1) Channel type (wireless channel)

2) Create the name trace the file

3) Set the distance of variables

4) Define Node Configuration

5) Creating the wireless nodes

6) Set the Node Size and the respective labels

7) Establish Communications between the nodes

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8) Call the Procedure for reducing Time delay

9) Call the procedure for reducing packet loss

10) Call the Procedure to stop if it the destination is reached.

IV RESULTS AND DISCUSSION

A network consists of 'n' number of Nodes. These nodes can request data from every nodes in the network. Since the Nodes have mobility property, they can move across the network. Network is used to store all the Nodes informations like Node Id, username, packet size etc. Also network will monitor all the Nodes Communication for security purpose. Each user requests to server through base station and gateway for access and data sharing.

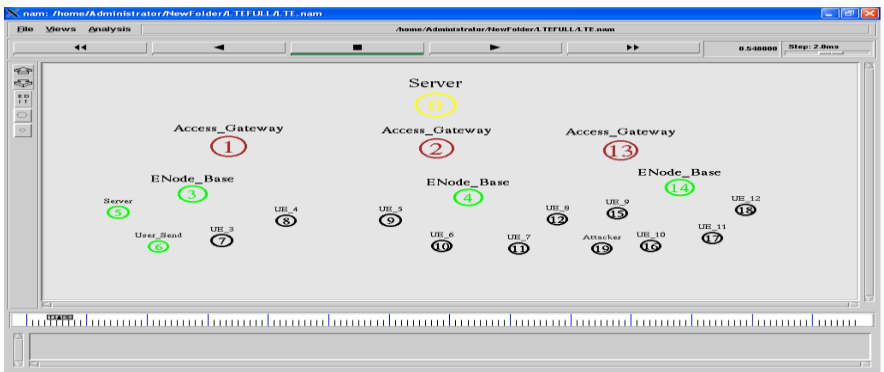

Fig 5: Based on coverage base station construct the Nodes.

Creation of the nodes, server updates and verifies the user details after receiving the user requests. Also each ENodeBs authenticates the user request for proper communication. Access gateway is used to transfer the user request from ENodeBs to server. Unauthorized user also gives the request to server through ENodeBs. But unauthorized user requests are not forwarded to server because ENodeBs authenticate each users' id based on location information using localization algorithm during the user request.

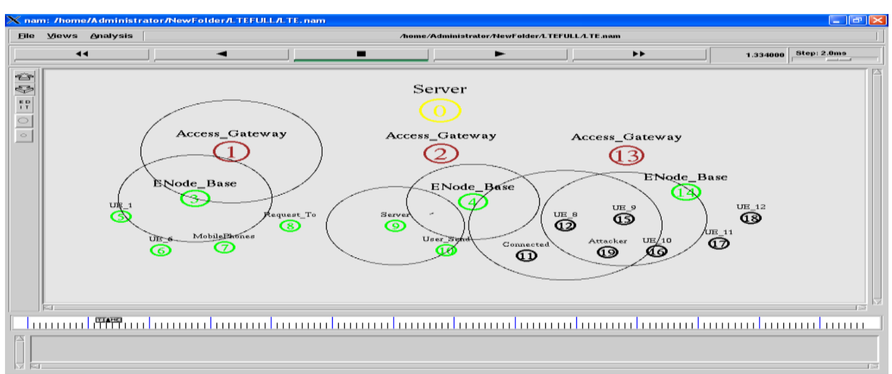

Fig 6: User request to Base station

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For authorization a request is sent to access gateway by the node. It is compared with the node id and upon matching communication is established. If there is a mismatch in the node id, the access gateway in turn forwards the request to server

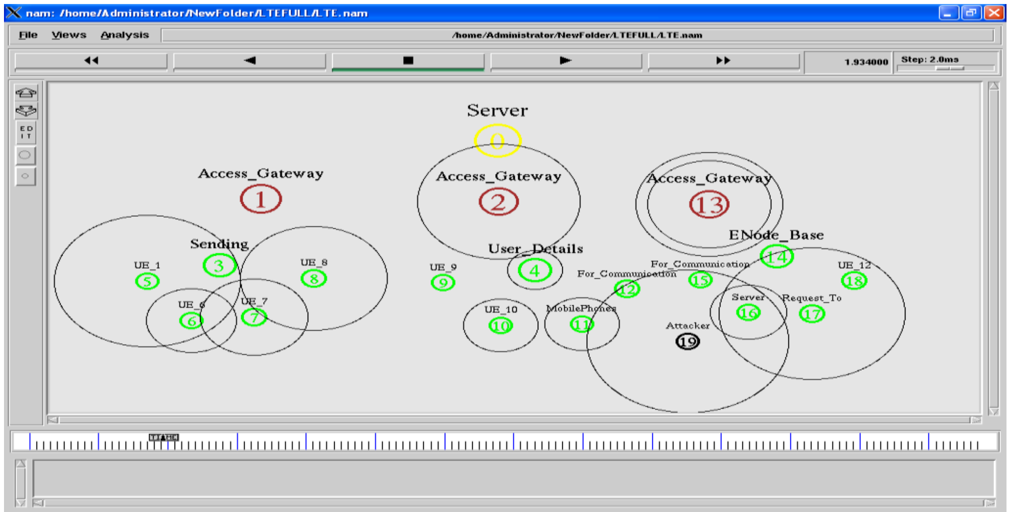

Fig 7 Methodology of request forwarding by eNodeBs

When node id verified by access gateway each user of node communicate with other nodes they can share or download the data and send request to server from access gate way.

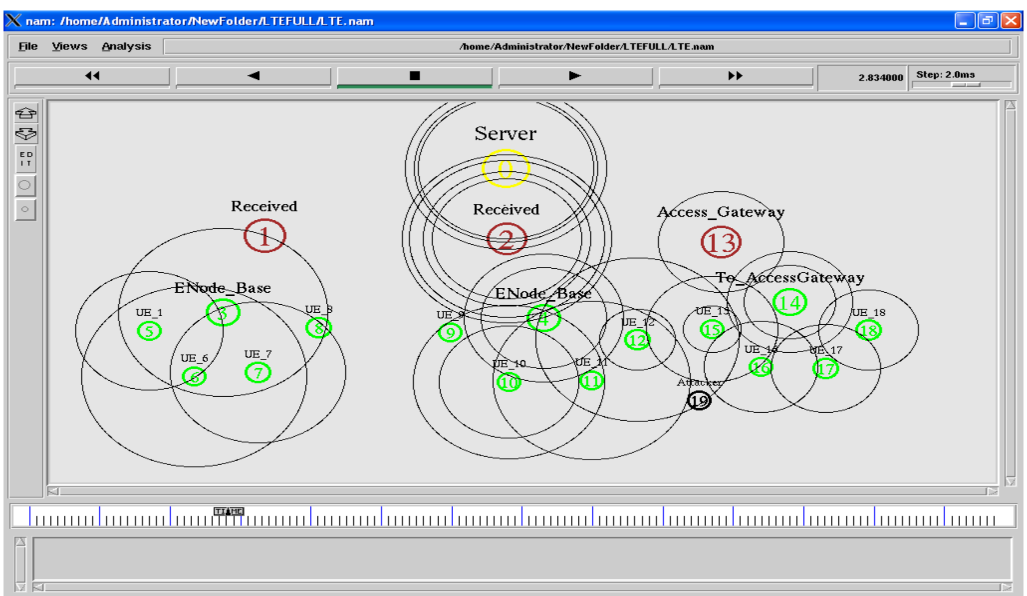

Fig 8: Request forwarding by access gateway to server

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In each user can download the packet or share the packet from one user to another after authentication process. Source node transmits one packet to destination node. The source first sends the packet to their ENodeBs after which packet goes to access gateway. Then access gate way finds the correct destination node. Then it forwards the packet to authorized access gate way of destination node. Finally packet reaches the correct destination node through ENodeBs. If not the request is forwarded back to the server again.

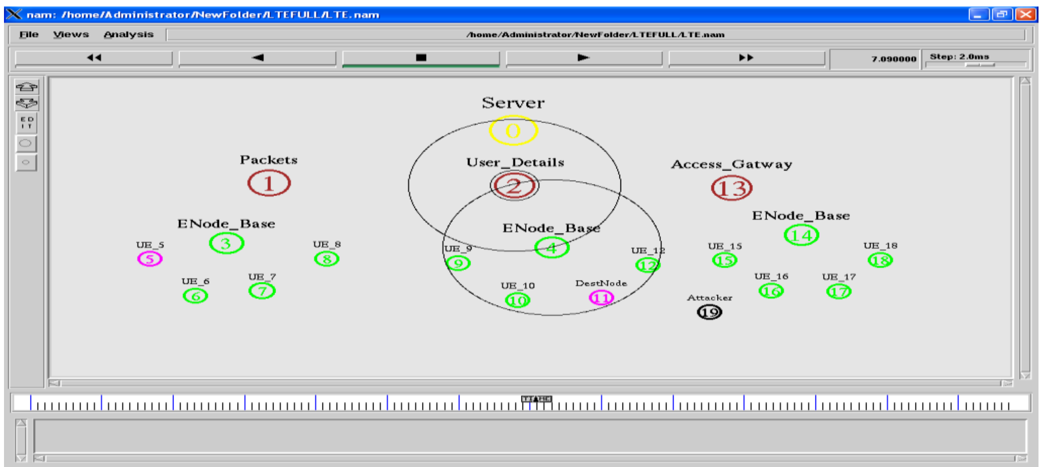

Fig 9: Destination nodes receives the packet from source

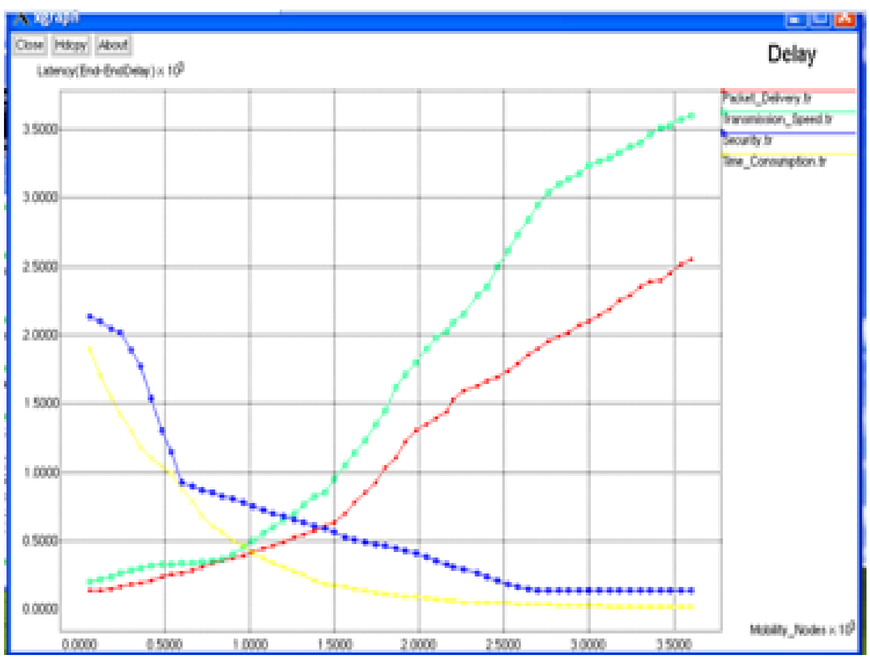

Fig 10: Details of packet loss vs propagation delay

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The above fig10 shows the packet loss and propagation delay while distributing the data from source to destination. More over when distributing the data the packet loss is 20% without applying localization algorithm. After that when applying the localization algorithm 93% reduced. At the same time the propagation delay is 15% without applying the localization algorithm, with localization algorithm 93% has reduced.

PARAMETERS	WITHOUT ALGORITHM	WITH ALGORITHM
Number of nodes	19	19
Protocol used	AODV,ODCL	AODV,ODCL
Types of wireless network	Hybrid network, Ad hoc network	Hybrid network, Ad hoc network
Propagation delay	20%	93%
Packetloss	15%	93%

PARAMETERS OF HYBRID CELLULAR AND AD HOC NETWORKWITH 19 NODES

V. CONCLUSION AND FUTURE WORK

5.1 CONCLUSION

Benefits and challenges of using dedicated MRNs(Motor Racing *Network)* to serve vehicular UE. Compared to serving vehicular UE directly from macro eNBs, MRNs can increase the performance of the UE inside the vehicle significantly, especially at the cell edge, because of MRNs can effectively creates better propagation conditions for the backhaul links compared to the direct links between macro eNBs and vehicular UE. As a result of simulations it reduces the packet loss and propagation delay in network usage by means of about 93% in comparison with a case that each nodes download data ads via cell network, and works efficiently in cases with a large number of nodes and high mobility.

5.2 FUTURE WORK

The performance of data dissemination protocols is evaluated in highway scenarios. However, in urban scenarios, there are many more factors which affect the load balancing, authentication and security, etc... This leads to the protocol performance degradation in cellular networks. Therefore, the quality and security issues can be addressed in future.

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