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# Signal Improvement with Reduced Handover Failure In 4g : A Review

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## I. INTRODUCTION

The quick development in remote correspondence innovation has changed human expectations for everyday comforts. This impact is obvious with the exponential increment in portable clients. To coordinate with the rising interest, there is a quick advancement in correspondence norms. This outcomes in fast development of models from one generation to other. Because of higher interest for information benefits on remote correspondence, the advancement prompted third era (3G) remote correspondence advances, Widespread Versatile Broadcast communications Framework (UMTS) and Wideband Code Division Various Get to (WCDMA). These advances give incorporated bundle astounding sound video and information administrations with portability bolster. The fourth era (4G) Long haul Development (LTE) is the progression of 3G innovation. Notwithstanding the typical voice and different administrations of 3G, 4G gives versatile broadband web access, through advanced mobile phones and other cell phones [3]. Potential and current utilizations of 4G incorporate altered portable web get to, IP communication, gaming administrations, top quality versatile television, video conferencing, 3D TV and distributed computing. Systems are separated into two classifications as:

### A. Homogeneous Systems

A system that uses a solitary system design and working framework. An illustration is an Ethernet neighborhood (LAN) in which all machines are running Microsoft Windows 2000 Server. Another case is an undertaking level informing framework construct exclusively with respect to Microsoft Trade Server. Homogeneous systems are the least complex systems to oversee, yet most corporate systems are heterogeneous systems for the accompanying reasons:

Spending plans are restricted, so it is not generally conceivable to overhaul a more seasoned heterogeneous system into a more up to date homogeneous one unless a definitive cost reserve funds can be defended to administration.

### B. Heterogeneous Remote Systems (HRS)

The heterogeneous remote systems constitute innovations extending from 2.75G to 4G and is required to go past [3]. A HWN comprises of multi-level systems with various capacities regarding working frameworks, equipment, conventions and applications with versatility. In this way, the HWN can meet the desires of the end client for better availability and portability with every conceivable application [1].

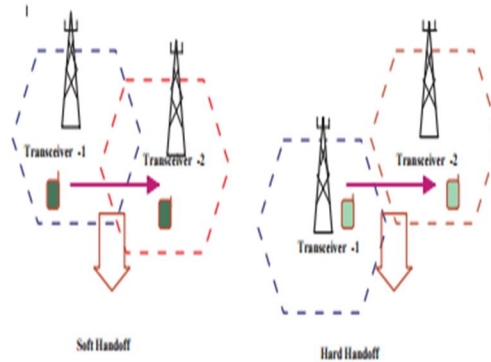
This repeats the significance of portability of the end clients. With the concentration to accomplish better versatility, heterogeneous multi-level system is mapped in a common urban condition and the multi-level constitutes benchmarks like GSM, EDGE, UMTS, Remote Neighborhood), LTE and so forth. This achieves the difficulties in different exercises of the system administration [5]. It is exceedingly basic for the end client to flawlessly benefit the administrations without disturbance while voyaging.

### C. Handoff: An Oversight

The procedure of exchange of a continuous association from the serving base station to the adjoining base station without intrusion is known as handoff. The handoff happens while the client moves from one cell scope range to nearby scope region.

There are two fundamental handoff strategies, Network Controlled Handoff (NCHO), Mobile Controlled Handoff (MCHO). In NCHO, the system settles on handoff choice in light of estimations of the flag quality at versatile station (MS) at various competitor base stations (BS). In particular, if the MS is measured to have a weaker flag in its current cell, while a more grounded flag is accessible in the neighboring cell, a handoff choice can be made by the system to change the client to new BS from the old cell. Such sort of handoff general takes 100-200ms and frequently delivers a recognizable interference in the discussion. Notwithstanding, general postponement of such a kind of handoff when all is said in done is in the scope of 5-10ms [1].

Subsequently, this kind of handoff is not reasonable to a quick changing condition and a high thickness of clients. NCHO was utilized as a part of the original simple frameworks, for example, AMPS [2, 9].



Hard Handoff and Soft Handoff

## II. OBJECTIVE

Each versatile client on the planet is sharp in getting to data while keeping up the portability. So the part of versatile hand-held gadgets to play out all sort of errands in different fields for better correspondence, enhanced profitability in business and lessened working costs, making the procedure speedier and productive. Broadcast communications specialist co-ops and different organizations giving different administrations are looking to approaches to streamline and upgrade the operations.

The top needs of all specialist organizations is to convey consistent portability in cutting edge heterogeneous remote systems, which can furnish consistent correspondences with an assorted qualities of administrations for every favored area extensively.

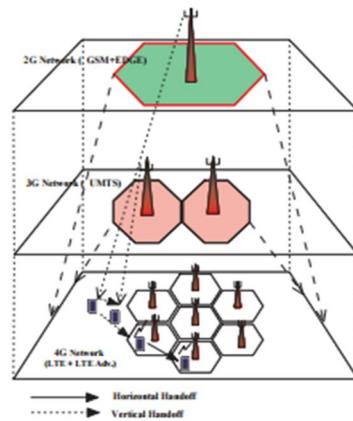
The issue related with the remote portable hand held gadgets is currently changing the capacity to do remote administration in the field of instruction, wellbeing, security, business and social relations. For these necessities novel handoff systems depend on taking after parameters like data transfer capacity, Signal to Noise Interference Ratio (SINR), handoff idleness, control utilization, organize cost, client inclinations, arrange throughput, arrange stack adjusting, organize security, RSS and speed of the User Equipment(UE) [6]. A few examinations have been made on VHO, taking individual parameters for GSM, WLAN and UMTS arranges under thought. However larger part of these discover an extension for having an incorporated answer for VHOS in heterogeneous systems including LTE (4G) considering every one of the parameters [7, 8].

### A. Taking after are the Targets

- 1) Carry out a broad examination to the exploration work done in the VHO.
- 2) Propose new systems for VHOS considering the nearby landscape, way misfortune model and RSS for all levels of remote systems in a K-level Heterogeneous Wireless Network (KHWN).
- 3) Analyze the proposed VHOS execution considering distinctive imperatives of the earth detailed in standard writing.

### B. Vertical Handoff in Heterogeneous Wireless Network

The prime goal of VHO is to accomplish versatility inside heterogeneous remote systems. The heterogeneous remote system comprises of different remote advancements to give differentiated administrations to the portable clients. Versatility administration addresses the key issues of area administration and handoff administration. Area administration tracks the UE for effective data conveyance. Handoff administration keeps up the dynamic associations with give consistent availability the UE, as they change their purpose of connection to the system. In the met HWN's, both intra innovation handoff and between innovations handoff coincide. Intra-innovation handoff is the customary flat handoff handle in which the UE handoff between two Access Points (AP) or base stations utilizing a similar get to innovation. Then again, between innovation handoff, or vertical handoff, happens when the UE wanders between various gets to advances, Figure speaks to an instance of HHO and VHO.

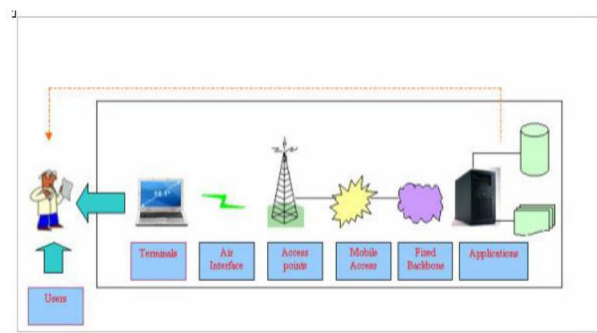


Vertical Handoff in K-Tier Heterogeneous Wireless Network

It is the conventional flat handoff prepare in which the UE handoff between two Access Points (AP) or base stations utilizing a similar get to innovation. Then again, between innovation handoff or vertical handoff, happens when the UE meanders between various gets to advances, the primary refinement amongst VHO and HHO lies in symmetry. While HHO is a symmetric procedure, VHO is an asymmetric process in which the UE moves between two distinct systems with various attributes. This presents the idea of a favored system, which is typically the underlay in the coveted HWNs, which gives better throughput execution, bring down inertness and mistake free at lower taken a toll for the clients. This is surely detectable that the approach of HWN take into consideration the organization of non-homogeneous handsets, with the benefit of enhanced ghostly proficiency per unit range. A standout amongst the most critical elements of HWN is the likelihood to get to every level of the HWN to the end clients for benefiting a wide range of administrations accessible. Rising originals for heterogeneous system designs rotate around the thought of the heterogeneous remote Network to give 'Different level', 'Multi-innovation' and 'numerous administrations'.

### C. 4G Wireless Technology

A 4G or fourth era arrange, another era of remote is expected to supplement and supplant the 3G frameworks. Getting to data anyplace, at whatever time, with a consistent association with an extensive variety of data administrations and accepting an expansive volume of data, information, pictures, video as demonstrated in figure are the key elements of the 4G frameworks.



4G Infrastructure

The future 4G foundation [9] will comprise of an arrangement of different systems utilizing IP as a typical convention so clients are in charge since they will have the capacity to pick each application and condition. A 4G or fourth era system is the name given to an IP based portable framework that gives access through a gathering of radio interfaces. A 4G organize guarantees consistent meandering/handover and best associated benefit, consolidating numerous radio get to interfaces, (for example, WLAN, Bluetooth, GPRS) into a solitary system that supporters may utilize [10]. With this component, clients will approach diverse administrations,



expanded scope, the comfort of a solitary gadget, one bill with decreased aggregate get to cost and more dependable remote get to even with the disappointment or loss of at least one systems.

4G was just an activity by R and D labs to move past the restrictions and address the issues of 3G which was experiencing difficulty meeting its guaranteed execution and throughput. 4G design incorporates three essential regions of availability: Personal Area Networking, (for example, Bluetooth), nearby rapid get to focuses on the system including remote LAN advances what's more, cell network. 4G requires an extensive variety of cell phones that bolster worldwide meandering. Every gadget will have the capacity to interface with Internet-based data that will be altered on the fly for the system being utilized by the gadget right then and there. The foundations of 4G lie in the possibility of unavoidable processing [11]. The paste for this is probably going to be programming characterized radio (SDR) [12]. SDR empowers gadgets, for example, mobile phones, PDAs, PCs and an entire scope of different gadgets to check the wireless transmissions for the most ideal strategy for availability at the best cost. In a SDR situation, works that are in the past done exclusively in equipment, for example, the era of the transmitted radio flag and the tuning of the got radio flag are performed by programming [13].

In this way, the radio is programmable and ready to transmit and get over an extensive variety of frequencies while imitating for all intents and purposes any coveted transmission design. As the quantity of remote supporters quickly increments ensuring the nature of administrations at whatever time, anyplace and by any-media winds up noticeably fundamental. These administrations require different systems to be incorporated into IP-based systems, which additionally require a consistent vertical handoff to fourth era remote systems. Furthermore, as one of the cutting edge versatile correspondences the fourth era portable interchanges gives different administrations, for example, rapid information administrations and IP-based access to Radio Access Network and so forth. Different interface systems, for example, WLAN, Bluetooth, UTMS and CDMA2000 are incorporated into the IP-based systems as an overlay structure. In this structure, the ideal administrations are given to versatile hosts. Versatile has in this structure can be associated with the system through different get to focuses. In addition, a consistent handoff ought to likewise be upheld between various air interface strategies amid internetwork development.

#### D. Elements of 4G Networks

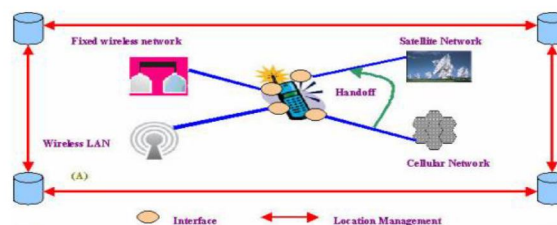
4G organize have taking after elements:-

- 1) *High Speed:* 4G frameworks ought to offer a pinnacle speed of more than 100Mbps every second in stationary mode with a normal of 20Mbps every second when voyaging.
- 2) *High Network Capacity:* Should be no less than 10 times that of 3G frameworks. This will animate the download time of a 10-Mbyte record to one moment on 4G, from 200 seconds on 3G, empowering top quality video to stream to telephones and make a virtual reality encounter on high-determination handset screens.
- 3) *Fast/Seamless Handover over various Systems:* 4G remote systems ought to bolster worldwide meandering over numerous remote and versatile systems.
- 4) *Next Generation Interactive Media Bolster:* The fundamental system for 4G must have the capacity to bolster quick speed volume information transmission at a lower fetched than today.

#### E. Architecture of 4g Network

Accessing different mobile and wireless networks is one of the most challenging problems to be faced in the deployment of 4G technology [14].

- 1) Using a multimode device
- 2) An overlay network
- 3) A common access protocol



Possible Architectures for 4G Networks

#### F. Multimode Devices

To get to administrations on various remote systems, one single physical terminal with numerous interfaces is utilized. Existing propelled cell phone framework on code division numerous get to double capacity wireless, double capacity satellite PDA and worldwide framework for versatile media communications are cases of Multimode Device design. Call consummation can be enhanced and scope region is extended adequately utilizing this engineering. At the point when there is system, connection or switch disappointment, solid remote scope ought to be given. The handoff between systems can be started by client, gadget or system. There is no necessity of remote system change or work of interworking gadgets as the gadget itself joins the vast majority of the extra many-sided quality. A database can be sent by each system which stores the data to monitor client area, gadget abilities, organize conditions and client inclinations.

#### G. Overlay Network

There are a few general get to focuses in overlay coordinate with which a client can get to. A remote system is chosen by every all inclusive get to focuses in light of accessibility, nature of administration particulars and client characterized decisions [15]. Convention and recurrence interpretation, content adjustment is performed by all inclusive get to point for the benefit of clients. As the client moves starting with one all-inclusive get to point then onto the next instead of the client or the gadget, handoffs are performed by overlay systems. Client organize, gadget data, capacities and inclinations are put away by the widespread get to point. Single charging and membership is upheld as general get to focuses monitor the different assets utilized by guest.

#### H. Normal Access Protocol

Supporting maybe a couple standard get to conventions by remote systems enables this convention to wind up noticeably feasible. Utilizing remote non-concurrent mode requires in6terworking between various systems as one conceivable arrangement. Transmission of ATM cells with extra headers or remote ATM cells requiring changes in the remote systems must be permitted by each remote system to actualize remote ATM. One convention may be utilized by at least one writes of satellite based systems while another convention is utilized by at least one earthly remote systems.

#### I. Handoff In 4g Networks

The administrations given by the Public Switched Telephone Networks (PSTN) [16] are utilized by remote cell phone system of Public Land Mobile Networks (PLMN). PSTNs are spines to PLMNs. Framework for remote get to, versatility administration and outer system entryways are given by the system components of PLMNs.

A basic PLMN [16] comprises of the accompanying parts:

- 1) Base stations
- 2) Mobile exchanging administration focuses (MSC)
- 3) Home Location Register (HLR)
- 4) Visitor Location Registers (VLR)
- 5) Authentication Center (AUC)
- 6) Equipment Identification Register (EIR).

### III. LITERATURE REVIEW

A few methodologies were proposed by various creators to get the ideal answer for discovering the VHO calculations for multi-level, numerous administration situations.

Bharghavan et al. [16], proposed a versatile QOS administration framework in remote sight and sound systems. The framework proposed depended on an administration show intended for both association and application level QOS. Remote sight and sound applications are ordered into various administration classes in the administration display by their application profiles. The framework plays out a versatile asset assignment for each administration class utilizing the proper CAC plans custom-made to the QOS necessities of the administration class under thought. It was exhibited through examination and reproductions, which the proposed framework meets the QOS necessities of various administration classes in the framework and accomplishes extensively high system usage.

Tooth. Y. et al. [17] introduced a scientific approach for execution assessment of remote cell systems. The diagnostic approach showed how basic numerical systems can be connected to acquire remarkable expository outcomes for some execution

measurements including call blocking and dropping probabilities. The investigation displayed more reasonable dispersion models for the included irregular factors.

Yi. Z. et al. [18] proposed many quantities of watch directs is designated naturally continuously to diminish the misfortune likelihood of handoff calls. A circumstance where the handoff calls are lined and no new calls are taken care of before the handoff brings in the line. Because of which this makes stricter than the protect channel techniques.

Akpan et al. [19] proposed a combination of bearing of portable into the M+G plan to diminish the handoff disappointment. The plan uses the course of versatile close by the flag quality and accessibility of directs in settling on the handoff choice.

Salih T. et al. [20] finished up and expressed that the blocking likelihood of handoff calls can be decreased by utilizing splitted rating channel and coordinated retry plans.

Chow-Sing L. et al. [21] proposed dynamic handoff need alteration conspire and expressed that the proposed plot lessens call dropping likelihood yet keep up high data transfer capacity usage and satisfactory call blocking likelihood.

Erbas et al. [22] proposed a profile-based plan to foresee client developments. In their plan, a client profile records the client's day by day areas. At the point when the client moves to another area, the profile records the adjacent three cells. The calculation gathers the most conceivable heading that the client will go to by checking the profile.

Natalizio E. et al. [23] proposed a helper station is set in the cell. At the point when every one of the channels of the base stations are occupied then approaching calls get associated with the assistant station for some settled time and in the middle of this helper station checks the base station for the free channel accessibility. On the off chance that free channel is accessible then the call disengaged from the helper station and get associated with the base station. Along these lines call blocking and dropping rate get lessened to some augment yet again a similar issue emerges when every one of the channels of base station and helper station are occupied. So this can be enhanced by utilizing the asset arranging model with the assistant stations. Asset Planning Model sends ask for with the expectation of complimentary channel accessibility to its neighbor cells. And all neighbor cells send their free channel to assistant station. Among the channels a typical channel is chosen which is free in every one of the phones to keep away from obstruction and continuous call at the helper station get associated with that free channel. Along these lines channels at the helper station turns out to be free and can deal with more calls and our call blocking and dropping rate get decreased to substantially more develop.

Narisetti et al. [24] suggested that Today's remote clients expect awesome things from tomorrow's remote systems. These desires have been powered by buildup about what the following eras of remote systems will offer. The fast increment of remote endorsers expands the nature of administrations at whatever time, anyplace and by any-media getting to be noticeably basic. Reconciliation of different systems, for example, CDMA2000 and remote LAN into IP-based systems is required in these sorts of administrations which additionally requires a consistent vertical handoff to fourth era remote systems. The proposed handoff calculation amongst WLAN and CDMA2000 cell system is actualized. The consequences of the reproduction demonstrates the conduct of the handoff and the time spent in WLAN or CDMA. The quantity of feeble flag signals decides if a handoff is required or not. In this calculation, movement is grouped into constant and non-continuous administrations.

Stevens-Navarro et al. [25] recommended that The cutting edge remote systems will bolster the vertical handoff component in which clients can keep up the associations when they change starting with one system then onto the next (e.g., from IEEE 802.11b to CDMA 1timesRTT system and the other way around). Albeit different vertical handoff choice calculations have been proposed in the writing as of late there is an absence of execution correlations between various plans. In this paper, we analyze the execution between four vertical handoff choice calculations, in particular, MEW (multiplicative type weighting), SAW (straightforward added substance weighting), TOPSIS (method for request inclination by likeness to perfect arrangement) and GRA (dim social examination). Each of the four calculations permit diverse properties (e.g., data transmission, delay, parcel misfortune rate, cost) to be incorporated for vertical handoff choice.

Prachi P. Patil [26] proposed a calculation to lessen the call drop issue utilizing vertical handoff in 4G arrange. The proposed calculation was based nature of got flag. To start with discover the quantity of systems accessible on the premise of RSS (got flag quality) at that point select the system higher RSS. At that point begin the handoff procedure. The usage was performed on test system which give the outcomes as increment in bundle conveyance proportion by 95% to 99%. The throughput was expanded by 40 bps in reenactment comes about. Different parameters like drop bundle, end to end delay, mistake rate and so on was additionally diminished in proposed 4G vertical handoff calculation.

Sunil Kumar [27] proposed a calculation for vertical handoff in heterogeneous systems to decrease the call drop rate. The calculation was executed on test system MATLAB 7.0. The recreation comes about got depended on parameter considering and without considering the immersion in a CACN arrange. The got comes about by reproduction was indicating less call drop rate when contrasted with the vertical handover calculation without considering immersion in a CACN framework.

#### IV. PROBLEM DEFINITION

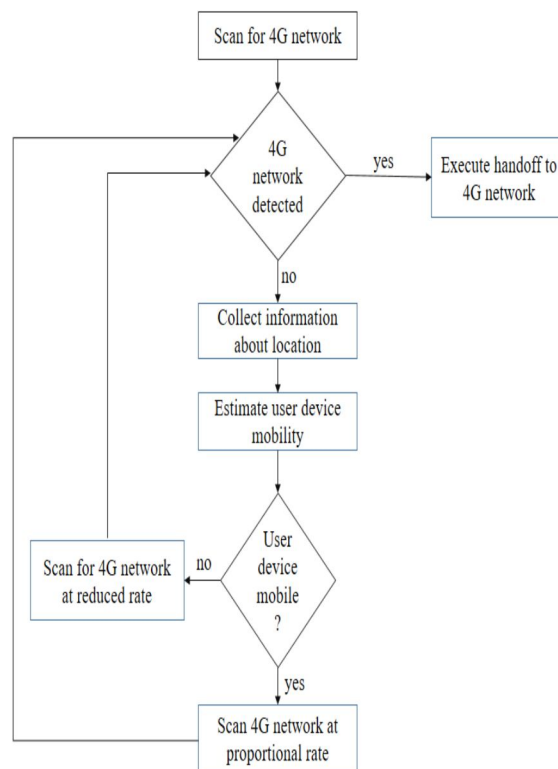
Each system is characterized with specific impediments and qualities. One of such restriction of system is constrained range correspondence. Here the work is characterized for such 4G organize. To play out the correspondence, finish system is separated in littler sub systems where each sub system is controlled by a base station. As the hubs are versatile, there is the prerequisite to deal with the circumstance of system exchanging called handoff. Such sort of handoff process gives greatest correspondence misfortune. The displayed work is characterized to give successful correspondence in such system.

Up until now, the reviews that have been accomplished for decreasing the call drop issue give distinctive calculations and ways to deal with lessen the call drop rate. However, the diverse methodologies have distinctive techniques and results. The essential inspiration of this exploration is to take out both the handover disappointment and call drop rate in a system. Aftereffect of this examination finishes up the qualities of good system which has an insignificant number of call drop rate.

##### A. The Finish of Research Work could Resolve Taking After Issues.

- 1) By what method can a base station select its neighbor cell's base station for handover when there is number of system suppliers accessible?
- 2) In what capacity can a system supplier accomplish max throughput from a network?
- 3) How to limit the harvest drop issue in 4G arrange?
- 4) Different handover plans are proposed, which one is most appropriate for a network?

##### B. Flow Diagram



Flow Diagram of Handover Process in 4G



## V. RESULTS

### A. Network Simulator (NS-3)

The simulation work is performed on simulation software named NS-3. It is an open simulation environment for computer networking research that will be preferred. NS-3 is built using C++ and python. Different modules are present in NS-3 to perform different network simulation.

### B. Following are the Modules

- 1) AODV Routing
- 2) Packet Sink
- 3) BRUTE Topology Generator
- 4) CSMA Network Device
- 5) IPv4 Mask Attribute
- 6) IPv6 Address Attribute
- 7) LTE Module
- 8) ICMP Protocol Model
- 9) TCP Model Etc.

Simulation table with parameter values

| Parameters            | Values                    |
|-----------------------|---------------------------|
| No. of nodes          | 15                        |
| Area size             | 50m x450m                 |
| Transmission range    | 70m                       |
| Data Rate             | 1 mbps, 2 mbps and 3 mbps |
| TCP window Size       | 25                        |
| Simulation time       | 10 sec                    |
| Transmission speed    | 100 bits/sec.             |
| Bandwidth             | 5000 bits/sec.            |
| Start Simulation time | 400 sec                   |

### C. LTE Module

To perform algorithm simulation in 4G LTE we need LTE module which is present in NS-3. The LTE module in NS-3 includes the LTE radio protocol stack (RRC, PDCP, RLC, MAC and PHY). LTE module has been designed to support the evaluation of following aspects of LTE system.

- 1) Radio Resource Management
- 2) QoS- aware Packet Scheduling
- 3) Inter-Cell Interference Coordination
- 4) Dynamic Spectrum Access.

### D. Different Matrices

List of parameters used as matrix in simulation:-

- 1) Packet Delivery Ratio
- 2) Error Rate
- 3) Packet Lost Ratio
- 4) Transmission Bytes/Received
- 5) Throughput
- 6) End-To-End Delay Time

- 7) Routing Overhead
- 8) Convergence Time

Matric Values after Simulation

| Matric                | Value              |
|-----------------------|--------------------|
| Packet Delivery Ratio | 96.28%             |
| Packet Lost Ratio     | 3.72%              |
| End-To-End Delay      | 0.0123649          |
| Transmitted Bytes     | 3.057924e+06 Bytes |
| Received Bytes        | 425497 Bytes       |
| Convergence Time      | 0.1 's             |
| Throughput            | 33608.7 kbps       |
| Routing Overhead      | 1.38696%           |

The performance of LTE module is being estimated with the help of simulation on network simulator. To estimate the final performance.

Consider some parameters that are given below.

- 9) Packet Deliver
- 10) Energy Consumption
- 11) End To End Deliver
- 12) Throughput
- 13) Convergence Time

The network is considered by 40m X 450m with numbers of nodes are 15 that are distributed randomly in mobile fields.

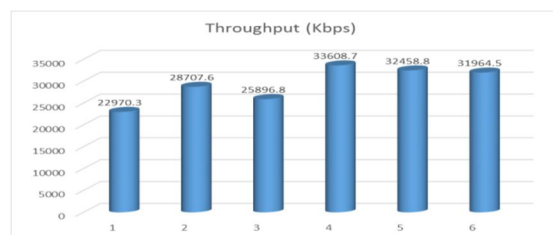
*E. Analysis*

To perform the analysis, the communication is performed on different network scenario. Each scenario is defined with some variations. These variations are defined in terms of communication parameters and the architectural parameters. In this section, each of the scenario is described with different variation adopted in the work. The major criteria considered here are the mobility and data transfer.

Result Metrics after Various Simulation

| Scenario | Through-put (Kbps) | Packet Delivery ratio (%) | Packet Lost ratio (%) |
|----------|--------------------|---------------------------|-----------------------|
| 1        | 22970.3            | 69.28                     | 31.72                 |
| 2        | 28707.6            | 79.31                     | 21.51                 |
| 3        | 25896.8            | 70.49                     | 29.51                 |
| 4        | 33608.7            | 96.28                     | 3.72                  |
| 5        | 32458.8            | 82.79                     | 17.21                 |
| 6        | 31964.5            | 92.82                     | 7.18                  |

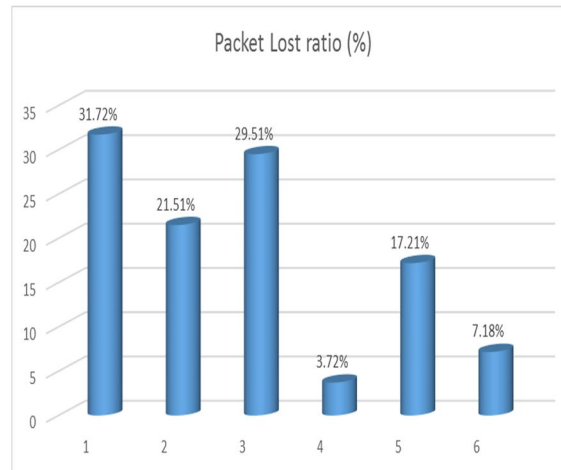
*F. Throughput*



Analysis of Throughput during Various Scenarios

The figure is showing the result analysis on different network simulator scenarios in terms of mobility and data transfer. The variation is here in mobility and data transfer. The figure shows that higher mobility causes less throughput in scenario- 1. As mobility is less, throughput is higher in scenario-4.

### G. Packet Lost Ratio



Analysis of Packet Lost Ratio from Different Scenarios

## VI. CONCLUSION AND FUTURE WORK

A usage of a ceaseless vertical handoff methodology and the powerful handoff calculation for the handoff move locale among the WLAN and CDMA cell system is displayed. Here, we have gone expansively about the different parameters that oversee the smooth agent of the calculation and how they influence the time spent in WLAN and CDMA systems. We produce the reproduction result and vertical handover situation between the WLAN and CDMA systems and consequently would give a significant valuable device to the gadget continuously working.

Handoff LTE module is portrayed that base vitality level then it doesn't transmit the bundles so the new hub will progress toward becoming collaborated with the tower hub on the grounds that the new hub has a most extreme level of vitality. So the proposed calculation is expanded the throughput and abatement of postpone that is superior to the current work.

In this work, a vertical handoff calculation is characterized for 4G LTE heterogeneous system. The proposed calculation is investigated on NS-3 test system. The work can be enhanced in taking after angles. Handoff is performed for heterogeneous system, in future some different measurements can be ascertained for further upgrades in system which improved the nature of a system.

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