

## Enhancement of Channel Coverage and Capacity of Heterogeneous Wireless Ad-Hoc Network Using RTP-RTCP Protocols

Dr.B.Sivakumar<sup>1</sup>, Prof. Mohan Babu.C<sup>2</sup>

<sup>1</sup>Professor, Dr. Ambedkar Institute of Technology, Bangalore

<sup>2</sup>Research scholar, VTU, RC-Dr.AIT, Bangalore, Belgavi

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**Abstract:** The usage of the network for cellular and Ad-HoC has becoming density due to limitations of capacity, coverage, and Quality of Service (QoS). We introduce the heterogeneous Ad-HoC wireless network for the increase of the coverage and QoS to satisfy the end-users. The proposed research work proposes Heterogeneous Real-Time Transport Protocol (HTRTP) and Real-Time Transport Control Protocol (H-RTCP) which utilizes different data formats and standards. For successful packet delivery ration between sources and destinations, the combined HTRTP and HRTCP are most close to IEEE 802.11 wireless mesh network. The combined routing protocol and routing algorithm are provided better Packet Delivery Ration (PDR), minimum Jitters, good end-to-end delay, and high throughput. The combined proposed heterogeneous network solves the problems of the number of packets sending over longer distances with different paths and increases the network capacity and converges. The designed heterogeneous network is validated by using the NS2 simulation environment and the obtained results are outperforming when compared with LTE and Wi-Fi technologies. The simulated results are shows that, there is an improvement of 23%, 45%, 12% and 78% in throughput, end-to-end delay, efficiency, and Jitter respectively.

**Key Words:** Ad-HoC wireless network, Capacity of the network, Heterogeneous network, LTE, RTP, RTCP, routing protocol and Wi-Fi

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### I. Introduction

Web traffic is depended upon to fabricate three to different occasions all through the accompanying three years due to the creating number of related PDAs. The amount of related devices and machine-to-machine trades is depended upon to outperform the amount of the people by a factor of two all through the accompanying three years. It is foreseen that inside the next decade, a further created Internet system will be required to help this extension in Internet traffic [1]. Bleeding edge remote frameworks need to address a couple of challenges, including the cost to cover high-thickness zones, swarmed events, tremendous regions or respond to passing changes looked for after e.g colossal diversions. The cost estimation is dependent on the quantity of required base stations and the cost to rent repeat gatherings. Interoperability is another test a similar number of contraptions use unmistakable working systems, shows, and access progressions. Framework faithful quality is moreover a critical issue that ought to be directed to ensure structures can suffer faults if there ought to emerge an event of fiascoes. In [2] presents heterogeneous framework building in which LTE and Wi-Fi remote devices are utilized to benefit by the information move limit of the each transmission advancement. Moreover, another guiding show for heterogeneous remote work frameworks is made, which picks intensely the transmission development to manufacture the general framework point of confinement and redesign the ordinary throughput. Additionally, another coordinating computation is proposed for the prerequisites of the directing show, which measures the cost of transmitting the traffic through every framework. The proposed computation considers the traffic load on the LTE masterminds as an estimation to check the cost of transmission over LTE and use transmission rate as estimation for the Wi-Fi work compose. This work gives the foundation of future research on making heterogeneous Wi-Fi/LTE work frameworks and using diverse remote headways as a segment of heterogeneous frameworks. The proposed guiding show can be contacted help diverse remote headways by utilizing their parameters in the learning estimation. The proposed designing gives a basic technique to broaden the versatile framework incorporation and limit and could add to the 5G establishment. Plus, the heterogeneous frameworks could be used to interface the Internet of Things frameworks and used to give the system to clever homes and sharp urbannetworks.

Another promising remote plan for the best in class period of remote frameworks is remote work frameworks (WMNs). The WMN is a perspective made to give wide framework consideration without using united establishment [4]. Along these lines, WMNs are a reachable choice to give a spine framework to metropolitan region frameworks (MANs). In such frameworks, sections (remote center points with a quick wired relationship with the outside Internet) are used to give Internet relationships with the work orchestrate. These building offers monetarily insightful all present remote relationship with the Internet in tremendous areas through the multi-bounce transmission to the entry and the different way. Regardless, the huge disservices of using WMNs are their obstructions to the extent to constrain, system execution, and guaranteed remote association quality. The explanations behind those issues begin in the multi-bounce nature of the framework. Exactly when data packages explore more hops in an immense WMN, they may either disregard to accomplish their objective or consume such a large number of framework resources. Also, if there ought to be an event of association or center point dissatisfaction, a couple of center points may end up disconnected from the framework in view of the nonappearance of a route to the objective or entry, and structure what is known as an 'island center point'. The use of heterogeneous advances in remote frameworks improves the general framework execution by scattering the pile across over different framework developments [5, 6, 7]. In any case, changing beginning with one transmission contraption then onto the challenges of the following present as each remote device utilizes different rules and data gatherings. In addition, controlling groups through a heterogeneous framework requires another segment to exchange control messages among the different frameworks. LTE [8] and IEEE 802.11 [9] are used in each remote center to shape the establishment for the proposed plan. In like manner, another directing show is made to engage the correspondence among the heterogeneous remote center points. A great deal of guiding tables and control messages are used to manage the interoperability of the proposed heterogeneous remote work sort out. Moreover, the paper proposes another heterogeneous guiding count called Cognitive Heterogeneous Routing (CHR) that engages heterogeneous frameworks to fill in as a lone framework. The groups are guided through different remote advancements reliant on the QoS estimations of every framework. To upgrade the assurance of the transmission advancement, another help learning estimation reliant on Q-learning is made to empower each center point to pick up from past exercises and improve the framework execution. Wide reenactments under different circumstances and traffic demand in the frameworks exhibit a throughput gain with up to 200% in the proposed heterogeneous framework when stood out from LTE and Wi-Fi justframeworks.

There are two sorts of controlling show in WMNs. The chief sort involves responsive coordinating shows in which the course is made on enthusiasm by flooding the framework with course requests. The course assurance is kept up only for center points that transmit traffic to a particular objective. Examples of this kind of controlling are unrehearsed on-demand expel vector (AODV) [10] and dynamic source coordinating (DSR) [11]. Responsive guiding causes some deferral in view of how a course is made exactly when there is data arranged to be sent. The second sort of guiding show involves proactive or table-driven coordinating shows. They keep up a table of the entire objective in the framework by irregularly appropriating an update of the guiding table to all center points. Objective sequenced expel vector (DSDV) [12] and improved association state controlling (OLSR) [13] are examples of this sort of coordinating show. The course table keeps up the course for each objective; transmission begins with no deferral if there are bundles arranged to be sent. Nevertheless, some overhead is incorporated for passing on coordinating table information among the center points in the framework. Some controlling shows, known as cross breed coordinating shows, join responsive and proactive coordinating to diminish the overhead obviously exposure by using proactive guiding for close center points and making courses for far centers using on enthusiasm coordinating[14].

## **II. Literature Survey**

This piece of the audit talks about structures that use various kinds of transmission innovations in remote systems. The heterogeneous system models are looked into as per the sort of transmission advances utilized in the heterogeneous systems (for example cell systems and Wi-Fi gadgets). A cell/multi-skip Wi-Fi configuration is proposed to move data packages for clients that experience the evil impacts of low channel quality or to offload a stopped up cell by sending the traffic from this cell to other non-blocked cells [14-17]. These frameworks utilize the multi-hop Wi-Fi mastermind as an associate framework to occupy traffic beginning with one cell then onto the following. Heterogeneous frameworks split data among broadband and Wi-Fi remote frameworks [5-7, 11-12] to extend the sort out point of confinement. One philosophy is to scatter traffic among frameworks adequately [5] by using load-altering estimations. Various plans use remote characteristics to suitable data among frameworks. For instance, frameworks with better divider doorways are utilized for indoor correspondence while frameworks with higher repeat gatherings are used for outside correspondence [6, 7]. Traffic need is used to supervise groups stream in heterogeneous frameworks [17] in which simply sensitive bundles from the Wi-Fi framework are sent through the cell framework to keep up a key separation from conniving associations. Wi-Fi sections are furthermore used to make Pico-cells to offload stopped up cells in

cell frameworks [17]. In [13] displayed a one of a kind figuring reliant on a fleecy basis for section decision from a VANET framework to the LTE Advanced establishment. This new philosophy has been diverged from the standard deterministic methodology that uses the CH as a default gateway. Two groupings and CH assurance computations have been examined and reenactment results exhibit that our show performs better results with respect to delay and package incident than the deterministic procedure for the two figuring's. Plus, reenactments show that a capable CH choice computation is fundamental to ensure extraordinary displays comparatively similarly as with C-DRIVE higher group setback midpoints have been seen than with focus counts. In our future works, we will focus on considering the presentations of FQGS computation and analyzing its flexibility while performing gathering head handovers in a bundled designing and redesigning the entryway deals organize where picked door candidate might be vague for a couple of source center points having a spot with a comparable pack extraordinarily if there ought to emerge an event of little packs[13].

In [14] explored the plan of vitality effective cell organizes through the work of base station rest mode methodologies just as little cells and researched the tradeoff issues related to these strategies. Utilizing a stochastic geometry-based model, we determined the achievement likelihood and vitality proficiency under dozing techniques inhomogeneous macrocell and heterogeneous K-level systems. Furthermore, we planned enhancement issues as power utilization minimization and vitality proficiency amplification and decided the ideal working recurrence of the macrocell base station. Specifically, we researched the effect of irregular resting and vital dozing on power utilization and vitality productivity. Numerical outcomes affirmed the adequacy of the dozing system in homogeneous macrocell arranges however the increase in vitality productivity relies upon the kind of dozing methodology utilized. What's more, the organization of little cells by and large prompts higher vitality proficiency, however, this addition immerses as the thickness of little cell increments.

Two cell determination diversions are proposed for various system situations to portray the association practices of nonsubscribers inside the transmission scope of the femtocell base station. With the thought of plausible utility capacities for nonsubscribers, the presences of unadulterated methodology Nash equilibrium are separately demonstrated for the two cell choice amusements dependent on their particular properties. Principle numerical aftereffects of this paper can be condensed as pursues [12]:

- Cross breed get to mode is better than shut access mode regardless of which viewpoint, endorsers, whole HetNet, or administrator income, is considered.
- Open access mode can result in higher limit with regards to the whole HetNet and more noteworthy income for administrator contrasted with both the half and half and shut access modes.
- Endorsers can acquire higher limit in the cross breed get to mode contrasted with both the open and shut access modes. In this way, it is proposed to receive cross breed get to mode so as to give higher adaptability to execution improvement all things considered, whole framework, and administrator[15].

### **III. Methodology**

#### **The Femtocell Base Station(FBS)**

FBSs, which record for 96% of all SBS [11], are little, economical low power base stations more often than not sent by the customer and are generally associated with the center media communications organize over the client's home wired backhaul broadband. In this regard, they look like Wi-Fi passageways [13], however rather, they use at least one business remote principles and authorized range [12]. The determination and access control to a little cell system are given by one of three access control components [14]. These are classified as - shut access or shut supporter gathering (CSG), open access or half and half access. In a CSG controlled system, just a subset of, pre- enrolled, clients can associate with a little cell though open access little cell enables all clients of the administrator to interface and utilize the little cell. In cross breed get to, a predetermined number of little cell assets are accessible to all clients though the rest of in a CSG way [13].

#### **Heterogeneous Networks**

To address capacity demand, SBSs including FBSs form part of the emerging so-called heterogeneous networks, hereafter referred to as HetNets. Traditionally network coverage and capacity has been provided by a layer of MBSs, whereas in HetNets MBSs operate alongside other, typically varying transmit power SBSs operating multi-standard radio access technologies and architectures. SBSs are primarily added to increase capacity in hotspots with high demand as well as to provide coverage fill for areas not covered by the macrocell - both indoors and outdoors. This results in a heterogeneous network with MBSs and SBSs providing increased data rates per unit area. Fig.1. shows an SBS being used to provide coverage at the cell edge which may be difficult to cover from the MBS.

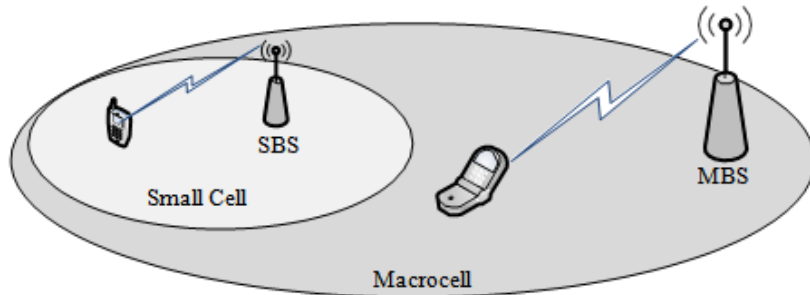


Fig.1.Heterogeneous Network

**EnergyMetrics**

Energy metrics are classified or metrics or energy consumption metrics as either EE or not . An EE metric is the ratio of the accomplished effort to the spent resources, whereas energy consumption metric is definite as the inverse of the EE metric i.e. a ratio of the consumed resource to the performed work. The consumed resource is the energy (Joule) or power (Watt) while the performed work could be the transferred bit rate, the number of served users, coverage area. Both metrics contain the same information but they are expressed in different ways.

**Energy ConsumptionMetrics**

The energy (E) per data packet bit (I),  $E_b$ , is the most common energy metric. This is given as the ratio amongst the average power consumed (P) and the average data rate (R). Hence  $E_b$  given given as the Joule per bit or Watt/bps.

$$E_b = \frac{E}{I} = \frac{P}{R} = \left[ \frac{\text{Joule}}{\text{bit}} \right] \text{ or } \left[ \frac{\text{Watt}}{\text{bps}} \right]$$

Similarly the energy ingesting ratio (EIR) is given per each and every packet data bit

$ECR = \frac{E}{M} = \frac{PT}{M} = \frac{P}{D} \text{ [J/bit]}$	(1)
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where E is the vitality required to convey M bits of data after some time T, and  $D=MT$  is the information rate in bitsevery second. This furnishes us with the vitality utilization in Joules expended for transportation of one data bit. The measurement permits the supreme exhibition of various remote systems or sub frameworks to be aligned [31]. As a basic model, an ordinary LTE base station segment may work over a transfer speed of 10MHz with a normal ghostly proficiency of 1.5 bits/s/Hz, in this manner accomplishing a normal information rate of 15Mbits/s. On the off chance that a base station heterogeneous femto cell transmits 8W of RF control, at that point the RF ECR esteem for this framework would be 0.53 microJoules per bit. Be that as it may if the absolute RF power is 150W the ECR would increment to 10microJoulesperbit. Also another measurement, the vitalityutilizationgain (ECG) is a relative measure as opposed to a flat out one [31] and is valuable for looking at two changed frameworks. For instance one may wish to consider a SBS with a solitary transmitting heterogeneous femtocell contrasted with one with two heterogeneous femto cells. The ECG is essentially the proportion ( $E1/E2$ ) where  $E1$  is a reference framework for example single heterogeneous femto cell SBS and  $E2$  is the two heterogeneous femto cell framework. The bigger the estimation of the ECG then the more productive framework two progresses toward becoming. To decide the decrease in vitality utilization between two unique frameworks, it is additionally helpful to consider the vitality decrease gain (ERG) which can be found as:

$ERG = \frac{ECR_1 - ECR_2}{ECR_1} . 100\%$	(2)
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where  $ECR_1$  and  $ECR_2$  correspond to the energy consumption ratio of two different systems.

### 3.4 EE Metric

The bit-per-joule capacity is an EE metric which measures the maximum amount of bits that are delivered by the network per Joule it consumed to do so and can be expressed as follows:

$C_J = \frac{I}{E} = \frac{R}{P} = \left[ \frac{\text{bit}}{\text{Joule}} \right] \text{ or } \left[ \frac{\text{bps}}{\text{Watt}} \right]$	(3)
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**Fig.3.** EE/SE trade-off in AWGN

The investigation can be stretched out to consider the intensifier effectiveness  $\rho$  of the transmitting sub-framework. Since EE is the channel limit standardized by the framework control utilization, where the absolute power utilization is a whole of  $P_t$  and the circuit control  $P_c$  it tends to be communicated as a component of intensifier proficiency [9].

$\eta_{EE} = \frac{W \log_2(1 + P_t / (N_0 W))}{P_t / \rho + P_c}$	(4)
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where  $\rho$  is the power amplifier efficiency. Although SE is the channel capacity normalized by the system bandwidth, the relationship of EE and SE can be shown as:

$\eta_{EE} = \frac{W \eta_{SE}}{P_c + N_0 W (2^{\eta_{SE}} - 1) / \rho}$	(5)
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### IoT RTCP

The adaptable variety of RTCP in like way ponders the condition of the IoT structure concerning the transmission of mixed media streams. In like way, its insights gather data around assets that might begin in the IoT structures and that move from different plans. It might vary besides ponders the sort of focus focuses (dynamic or inert). The specs of everything in the IoT structure, for example, managing, memory, and criticalness, ought to be considered. Also, uncommon mixed media coding must be reflected. Minimization of RTCP insights without affecting the sight and sound correspondence complete IoT structures is a basic fixation in RTCP, particularly if there should be an occasion of system famishment. To achieve the objectives, the prioritization of control reports ought to be related. In the standard RTCP, there are two basic sorts of reports, explicitly sender report (SR) and recipient report (RR). SR contains different components, for example, the measure of transmitted bundles inside a period, the different fields of the RTCP, for example, Network Time Protocol (NTP), and synchronization sources, timestamps. In RR field contains different fields, for example, separate lost (FL), surveyed number of gatherings expected (NPE), and between landing jitter. In SR, RR and RTCP must be revived by gathering different fields to gather express information around the IoT structure. In like way, these insights will be imparted under the kept environment to bind the over-alarmed of the extra fields. As conveyed above in the real thought of IoT-RTP, IoT-RTCP besides confines the insightful media session into a social affair of clear sessions. All sessions have a director that is picked utilizing the system revealed. The division of mixed media session strategies ought to be compelled with session measure [1]. If the sight and sound session measure is more prominent than an ordained edge, For any situation, by prudence of a standard sight and sound session, the division framework will be neglected. The edge what's dynamical, ordinary sizes are portrayed in the reenactment section.

#### Proposed algorithm: RTCP-IoT with Cloudstorage

AT: Allocated time for receiving of the packet in the interval on the reception of the report (RR). UL: Upper level of complete multimedia divisions.

ML: After Separation of the Middle level sessions. NL: After Separation of the Lower level of session.

EED: end-end-delay.

PL: packet loss. J: Jitter with delay

R: Report on the reception of the packet

*if*( $TP < AT$ )

begin for  $K=1$  to UL

begin

for  $Z=1$  to M begin

for Q=1 to Nbegin  
 if(EED, PL, J are standardlogics) begin  
 IoT-RTCP stoped the additional fields Report on the reception of the packet  
 end else begin

$$R_K = R_Z + R_Q$$

AT value should be increased and include additional fields for the RTCPand send  $R_K = R_Z + R_Q$ end

$$R_M = R_{UL} + R_Z$$

Datasets

End

the  $R_{UL} = R_Z + R_Q$  packets from the cloud and plots in the NS2 for validations of multimediaend for termination

#### **ALGORITHM/ PROPOSED METHODOLOGY**

The proposed methodology/ algorithm can be broadly classified into following:

Step 1: select the patient for analysis

Step 2: read the input data from the various sensors inserted to patient.

Step 3: By receiving the data from different sensors by creating wireless body areanetwork. Step4: start transmitting data using RTP/RTCP.

Step 5: analyses the data for uploading to cloud

Step 6: receive data through cloud storage using same protocol during transmission.

Step 7: RTP-RTCP system for assisting the data share to expert.

Step8: remote access by the doctor

Step9: generate the respective prescription for particular patient Step 10: repeat step4 to step 6

Step 11: the corresponding prescription will reach through safe and efficient channel to Patient care taker.

#### **IV. Simulation Results**

Simulation results in the form of SINR cumulative distribution function (CDF) based on, bit error rate (BER) measurements and capacity/rate calculations based on were taken at the UE associated with the SOI. These provided the necessary inputs to determine the power reduction possible when compared to a single heterogeneous femto cell. SINR CDF results in **Error! Reference source not found.**6– **Error! Reference source not found.** show the performance relative to the cell spacing at the SOI UE for the 50% loaded case. Each graph shows a CDF curve for each heterogeneous femto cell spacing/CSI method combination. Since the performance between each case is very close or overlaps only the best and worst cases have been annotated. The performance relative to the single directional heterogeneous femto cell case is shown. The impacts on SINR are evident for each heterogeneous femtocell spacing and the spread in SINR from the worst case to the best performer is shown to range from 3.5dB for the two heterogeneous femtocell to 11 dB for the four heterogeneous femto cell case. We note that for the two heterogeneous femtocell,  $f_d = 0.01$  Hz case, the all directional heterogeneous femtocell performance is better (has a

higher SINR) than all beam formed cases using single heterogeneous femtocell CSI. For the two heterogeneous femto cell,  $f_d = 1.95$  Hz, the increase in Doppler frequency shows all beam forming cases outperform the all-directional case. For the four heterogeneous femto cell case all-directional, performance is close to single heterogeneous femtocell beam forming with element spacing of  $0.25\lambda$ . As in the two heterogeneous femtocell, four heterogeneous femtocell beam forming performance improves with increased Doppler.

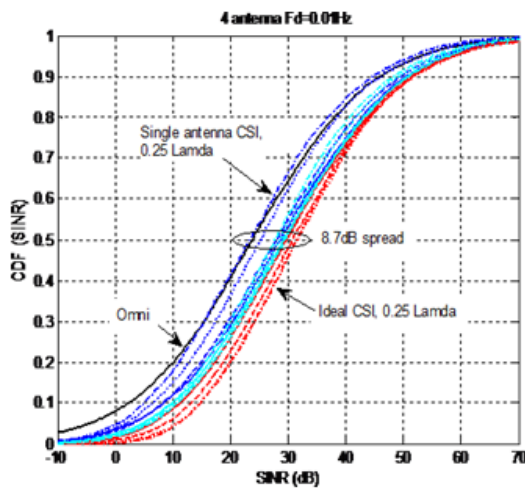


Fig.2.Four heterogeneous femto cell SINRCDF,  $f_d=0.01\text{Hz}$

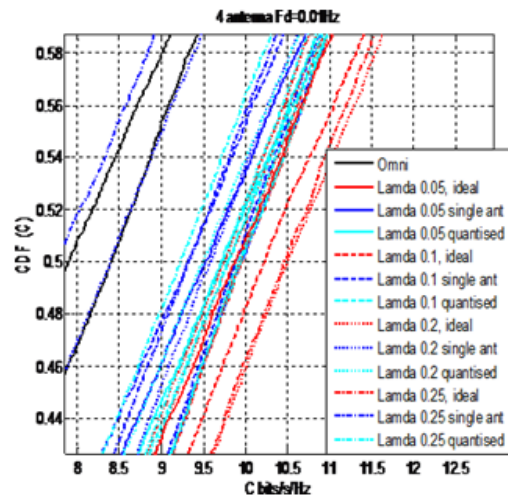


Fig.3.Four heterogeneous femto cell capacity CDF,  $f_d=0.01\text{Hz}$

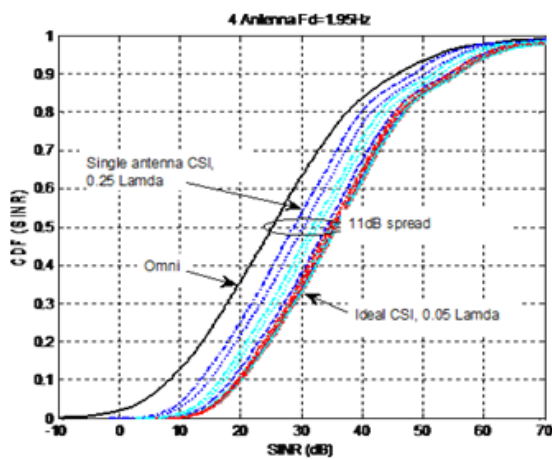


Fig.4.Four heterogeneous femto cell SINRCDF,  $f_d=1.95\text{Hz}$

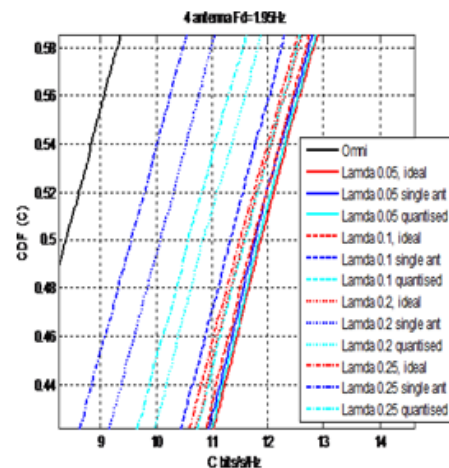


Fig.5.Four heterogeneous femtocell capacity CDF,  $f_d=1.95\text{Hz}$

### V. Conclusion

This research work presents another heterogeneous system using RTP-RTCP in which LTE and Wi-Fi remote gadgets are used so as to profit by the data transfer capacity of every transmission innovation. What's more, another directing convention for heterogeneous remote work systems is created, which chooses powerfully the transmission innovation so as to expand the general system limit and upgrade the normal throughput. Also, another steering calculation is proposed for the requirements of the directing convention, which gauges the expense of transmitting the traffic through each system. The proposed computation considers the traffic load on the LTE orchestrates as an estimation to assess the cost of transmission over LTE and usages transmission rate as an estimation for the Wi-Fi work arrange. The reenactment results show that the proposed framework achieves up to 150% more throughput differentiated and Wi-Fi-just frameworks and LTE-just frameworks. The heterogeneous framework configuration manages assorted remote contraptions as a bit of a solitary virtual framework. The LTE framework is utilized to avoid stopped up Wi-Fi center points and high impediment route in the WMN while the WMN offloads the load of the LTE sort out, diminishes the cost of using more grant repeat gatherings and advances the data to another center when the LTE throughput is defiling. This work gives the foundation of future research on making heterogeneous Wi-Fi/LTE work frameworks and using diverse remote advancements as an element of heterogeneous frameworks. The proposed directing convention can possibly be reached out to help different remote advancements by using their parameters in the learning calculation. The proposed design gives a simple method to grow the versatile system inclusion and limit and could add to the 5G framework. In addition, the heterogeneous systems could be utilized to interface the Internet of Thing systems and utilized to give the framework to savvy homes and keen urban areas.



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