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# A Survey on HetNet to Enhance QoS in 5G Network Using Various Techniques

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**Abstract**. HetNet (Heterogeneous Network) has been suggested for next age group wireless systems to meet the exceptional difficulties of advanced data rates. The specifications for various levels of QoS (Quality of Service) from various kinds of wireless requests and service areas are met. In this HetNet in to improve the QoSand SINR (Signal to Interference plus Noise Ratio), many techniques have been performed to provide satisfactory outcomes. This paper gives a comparative survey on the QoS and various techniques used, which are used to enhance QoS.

**Keywords**. QoS, HetNet, SINR

## 1. Introduction

HetNets play a vigorous role in imminent 5G wireless cellular network arrangement. Low latency, fast throughput, improved scalability, high consistency, and energy efficient networking infrastructure are all features of the 5G network. HetNets are used to enhance the QoS, which is mostly operated in the network layer ie layer 3. QoS is used to control traffic and ensure performance. It enables to adjust the overall network by prioritizing precise high-performance applications. QoS depends on the number of users and traffic demands.

## 2. Related works

Fabio de Oliveira Torres et.al [1] Using computational intelligence methods, investigate a reduction of interference paradigm between SC (Small Cells) in a complex environment. It was discovered that issues relating to the system's complete observation were successful by using Gas (Genetic Algorithms). Improvements found during the simulations in the QoS were reduced by lag above 33 percent and found a drop in metaheuristic, the co-channel interfering was decreased, and the SINR was increased by 80 percent.

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Tahseen Ul Hassan et.al [2] projected the fantastic solution for femtocell, developed an expanding exposure and divesting data from existing LTE cellular networks. This paper adopts the APC (Active Power Control) methodology to achieve a greener femtocell by reducing ICI (Inter-Cell Interference) in an MUE (Macro User Equipment) while also reducing needless power usage. The simulation outcomes demonstrate that using the APC technique lessens ICI and enhances the MUE's throughput efficiency. The APC method strikes a balance between achieving the FUE's (Femto User Equipment's) required QoS and lowering MUE, the survivor of ICI.

Jun Zhu et.al [3] proposed that in a HetNet a less power indoor femtocell was installed in the current MBS's (Macro Base Station's) service area. FAP (Femtocell Access Point) is a low cost and power indoor wireless contact network that offers the highest speed coverage and shortest-range coverage area. The FAP satisfies the QoS needs of consumers who are supported by MBS and FAP. Consumers who are assisted by MBS and FAP have their QoS requirements fulfilled by the FAP. The efficiency of a low difficulty in QACS, a macro femto HetNet system based on arbitrary beamforming broadcast was developed.

Zejue Wang et.al [4] introduces Hetnet has integrated the Cloud-RAN (Cloud Radio Access Network), a lowest-cost cellular network distribution tool to a disturbance management system and spectral capacity management. To gain useful spectral tools, spectral efficiency, QoS are comprehensively considered. The probability of weighted dependent spectral resources allocation algorithm was suggested to solve the optimization problem. Consequently, led to the expected algorithm has a developed a reduced likelihood of macrocell consumers suffering outages and frequency reuse efficacies.

Jingmiao Wu et.al [5] proposes that in HetNets DUDE (Downlink and Uplink Decoupling) is an idea for enlightening the uplink presentation. This uses uplink interference moderation through frequency reuse and power control schemes. Therefore, to improve the performance of the system's range utilization and uplink users DDPC (Dynamic Distributed Power Control) is utilized. SINR thresholds were maintained at all time. The simulation results show that QoS and uplink data rate performance were better.

Imad Al-Samman et.al [6] In systems, intra and inter tier interference have an overall success has a huge influence as a result spectral resource management and interference became more difficult. HetNet networks use C-RANs. To accomplish interference management and useful spectral resources, the HetNet and C-RAN were used. This paper suggests a user-weighted probability algorithm for distributing suitable spectrum barriers to each BS to meet maximum user throughput and specific QoS requirements.

L. Manjunath et.al [7] proposed the task of meeting, high data rates the ever-increasing request while maintaining a consistent QoS in the network. One of the most significant in the use of communication technologies and data is it consumes less energy. It creates hardware by merging interface mitigation and base position of switch-off techniques.

Zeinab A. aboelezz et.al [8] proposes that one of the significant processes ishandover, which has an impact on QoS. Based on the handover process, this paper proposes a fuzzy logic technique to estimate LTE networks in QoS. Many precepts in the fuzzy technique are grouped as many staged fuzzy logics, which have been reduced. QoS is calculated in three stages which provide 100% with low jitter, high throughput, and low loss rate, low network delay are all constraints.

Muhammad usman Iqbal et.al [9] proposed that HetNets can only be used if an algorithm that is adaptive and self-organizing the current conditions is used. SC-based

ultra-dense HetNets are evaluated using a QL (Q-Learning) based adaptive resource allocation scheme. This solution guarantees a QoS to 16 SCs and the measurements of SUE (Small cell User Equipment) was about 1.5 b/s/Hz.

Zeeshan Kaleem et.al [10] proposed that the HetNets two-tier is a concept in which short-range and low-power femtocells are used to meet QoS requirements which are kept placed beneath macrocells. In this paper, one of the main problems that have been addressed so that the HetNets to be successfully deployed is co-channel interference. FFR (Fractional Frequency Reuse) systems have been anticipated in a way to make the most of the fields available. A QoS-DFFR (Quality of Service-based Dynamic FFR) scheme was also suggested. Waleed AlSobh et.al [11] proposed that the main involvement is machine learning style QL control algorithms that are existing in the downlink to optimize the power of 5G networks. This paper suggests two QL algorithms for allocation of power: formulated and distributed algorithms. The distributed technique algorithm outstripped the cooperative and formulated approaches. The number of MUE-QoS of FUEs served grew to the detriment.

Jihene Ben Abderraza et.al [12] inspects how to boost the consumer association and the Almost Blank Subframe (ABS) ratio calculation in HetNets at the same time. In a two-tier HetNet, this paper proposes a unified heuristic algorithm for obtaining the correct ABS ratio while increasing the user's number. SINRs can be detected in sub-bands of both secured and exposed techniques.Ying Loong Lee et.al [13] The tools and techniques challenge for LB (Backhaul Load Balancing) and QoS in HetNets is discussed in this paper. For HetNets, a user alliance technique was proposed to accomplish backhaul LB and QoS utilization. In respect of QoS, call blocking probability, and justice, simulation results reveal that the proposed plan outperforms the current user association technique.

## 3. Literature survey

**Table 1**. Design Specification on existing work for different metrics.

| .NO | TECHNIQUES USED | QoS ACHIEVEMENT | SINR ACHIEVED | PARAMETER METRIC |
|---|---|---|---|---|
| [1] | Generic algorithm (GA) | Improved with a lag of 33% | 80% | - |
| [2] | Active Power Control (APC) technique | Provides balanced tradeoff | - | The power saved by13.51% |
| [3] | Coordinated random beamforming and user scheduling strategy | QACS makes it improved | Satisfies femto-MT (macro-MT) | Throughput is improved |

| | | | | |
|---|---|---|---|---|
| [4] | Weighted-based Spectral - Resource Allocation algorithm and CRAN | Hetnet's spectral resource distribution optimization problem was taken into consideration. | - | Frequency reuse and efficiency is improved |
| [5] | Downlink and Uplink Decoupling (DUDE)& Using frequency reuse and power management systems, the uplink interruption may be reduced. | Better | SINR of the DUDE scheme is 83% in RFA. | Uplink data rate performance is better |
| [6] | User weighted probability-based algorithm | Improved | - | Cost effective and Spectral efficiency is better |
| [7] | interference management algorithms & backhaul | Stable | - | - |
| [8] | Handover and QoS Control and Fuzzy logic design | 100% | - | low loss rate, high throughput, low network delay, and low jitter. |
| [9] | Q-learning and machine learning | Increased by 37.5%SCs & 33% higher than the minimum required QoS | - | - |
| [10] | Fractional Frequency Reuse (FFR) scheme | Performs remarkably high | - | Reduced packet loss and high throughput |
| [11] | Distributed and Formulated are two Q-learning algorithms for Power Allocation. | Increased value | - | The number of served FUEs increased. |
| [12] | Centralized heuristic algorithm | Minimized | - | - |
| [13] | Backhaul Load Balancing (LB) | satisfies UEs | lower blocking probabilities at 150 and 200UEs | - |

The analysis of various design specification on existing work for different metrics has been discussed and shown in Table 1. This table is based on techniques used, QoS, SINR and, parameter metrics on each paper were compared.

## 4. Conclusion

This paper has investigated the problem related to, Quality of Service (QoS) which has been enhanced in heterogeneous networks (HetNets) using various techniques and the problems related to (SINR) Signal to Interference plus Noise Ratio have been compared.

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