A Novel Call Admission Control Algorithm for Next Generation Wireless Mobile Communication

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ABSTRACT

Wireless communication technology is progressing very vastly. With this change in technology customer services for multimedia and non-multimedia are increasing day by day. But due to limited resources of the wireless network, we need to design an efficient CAC algorithm to enhance QoS levels for end users. The Quality of service (QoS) enhancement in the wireless network is related to making an efficient use of current network resources and the optimization of the users. Call acceptance in CAC is one of the challenge in mobile cellular networks to ensure that the acceptance of a new call into a resource limited wireless network should not deviate the service level Agreement (SLAs) at the time of conversations. In the next generation wireless network, CAC has the direct impact on QoS for user calls & overall system performance. To handle handoff calls and new calls in cellular network channel reservation scheme have been already proposed to reserve system bandwidth for higher priority call for CAC. This earlier proposed scheme is not as per the required level of satisfaction because the available reversed bandwidth is not allocated properly in case of least handoff rate. In this, the authors like to present a new channel borrowing scheme where new non real time (NRT) calls can make use of reserved channels. It can borrow this reserved channel on a temporary basis and after this immediately if any handoff call enters the current cell and no any other channels are available, then it will pre-empt the channel from an earlier borrowed NRT user if exists. This pre-empted NRT call is kept in the priority queue to consider its service when any channel becomes free. The number of NRT calls in the queue should not be large to avoid delayed service. The fundamental objective of the proposed scheme to design of the system for evaluating the results and comparing with the results of the existing system. From the results of current research work, it is observed that proposed scheme decreases call dropping probability which increase slightly in call blocking rate over high-density handoff call rate.

KEYWORDS

Bandwidth Reservation, Call Admission Control, Channel Borrowing Method, Handoff Calls, Non Real Time Calls, Real Time Calls

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1. INTRODUCTION

The wireless communication network users have been rapidly increasing for new multimedia services such as video conferencing, VoIP, IP, etc. The need for the high-speed communication network and a proficient radio resource management (RRM) is therefore required to improve the QoS of CAC algorithms. The RRM intends to improve system performance by optimizing the overall system capacity in the 4G network by preserving Quality of Service characteristics of mobile users. The WiMAX-worldwide Interoperability & Long Term Evolution are two evolving wireless technologies which are designed to provide the high-speed data access rate. Currently, the research on the performance evaluation and enhancement of next generation wireless network has been under consideration of researchers. In next generation network call admission control (CAC) is considered as one of the radio resource management (RRM) which is having a direct impact on Quality of Service for an individual RT & NRT calls as discussed in the earlier research articles many times (D Niyato, E Hossain, 2005; M. S. Pan, Chen Lin T.MW-T, 2014). For CAC, the RRM mechanism is very essential for QoS provisioning in cellular networks. The key idea of call admission control (CAC) is to ensure the QoS of individual calls by neatly managing the network resources. The main characteristics that call admission control policy has to provide are as following:

1. Establish a robust priority assigning mechanism for handoff calls and RT and NRT calls.
2. Design a low call blocking probability.
3. Allocate resources fairly.
4. Achieve a high network throughput
5. Avoid congestion

The call admission control algorithm should not violate the SLAs of ongoing calls during admission of new calls. The call admission control decision should be taken by considering multiple parameters such as the network properties, the user probability, the service category, and the network status which is discussed in many research articles like (Yu, Leung, 2002; Tsiropoulos, Stratogiannis & Tsiropoulos, 2010; Jiao, Zhang, Gong et al., 2015). As stated in the research article by Yu, Dutmiewicz, Huang, and Mueck, (2011), the required resources will be reserved if decision is taken positively to maintain the Quality of Service of the new user. The channel and base station assignment, resource reservation and power control are strictly required for resource allocation. The admission criteria applied in the decision-making part of the CAC scheme could be: 1) Bit Error Rate (BER). 2) The call dropping probability (CDP). 3) The QoS at connection level as determined by the data rate. 4) The delay bound, the signal to Noise Ratio (SNR), the ratio of energy to noise & call blocking probability. This topic has been covered by many researchers in past (Hong & Reppaport, 1986; Kwan & Chol, 1998).

1. The call blocking is considered as avoiding new calls because of insufficient resources like bandwidth in the cellular network to meet the QoS.
2. Call dropping is considered as breaking of current ongoing call at the time of handoff procedure. Call termination of ongoing session is very frustrating than delaying a new user call. That’s why higher priority is given to handover calls in new cellular networks. So we can either reserve some bandwidth for handover calls or adaptively allocate channels individually in the cellular networks as per the article by Tsiropoulos, Stratogiannis and Tsiropoulos (2010).

To provide service to high handoff rates, an efficient, robust call admission control mechanism is required. This encourages to propose a new call admission control mechanism. The existing reservation based call admission control mechanism is to minimize call dropping probability (CDP). In this mechanism, some bandwidth is reserved for handover calls therefore, new originating calls
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