Available online www.jsaer.com

***Journal of Scientific and Engineering Research*, 2019, 6(10):48-51**

Research Article

ISSN: 2394-2630
CODEN(USA): JSERBR

A Data Base System for the Analysis of Handover Mechanism in Communication System

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Abstract Cellular communication system has mobility as one its characteristics. This makes it irresistible to all and sundry. It enables people to communicate on-the-move, which leads to transfer of users (user equipment) from one radio network to another. The term for this transfer of users (user equipment) from one network to another is known as Handover. Handover takes place for two reasons; cell crossing or signal current channel deterioration. One of the methods of improving the cellular network performance is to employ an efficient handover prioritization management scheme when user (user equipment) moves from cell to another. An overview of handover, handover type, commonly used handover management type. In this paper an analytical database framework that can enhance considerably the handover mechanism in wireless network.

Keywords Communication Network, Handover, GSM, CDMA, hard Handover, softer handover soft handover, RSSI, MSC, BSC

1. Introduction

The major characteristics that made wireless cellular communication system WCCS an indispensable is mobility. Handover is the process of achieving Continuous service as the user moves in-between cells. Handover is needed during cell-crossing or/and signal quality degradation in the current channel. During handover, there is switching among networks and thereby transfer users to another network or BS [1]. The fundamental of 5G is heterogeneous networks and in such networks, seamless handover is non-negotiable [1].

Handover takes place in three phases; discovery, decision and execution. Discovery phase is about locating a suitable network with the desired Quality of Service. Decision phase initiates the handover and determine when the handover should occur. These phases determine how seamless the handover should be. When the time of initiation is not proper, it causes an improper handover or poor Quality of Service which results to high call drop rate. Hence, timeliness of handover by trigger handover decision putting into consideration all the parameters to properly ensure QoS is not affected and unwarranted handover is eliminated. These parameters considered while taking decisions are: received signal strength indicator, RSSI, signal to noise ratio, SNR, Distance, Velocity, Network coverage, Delay, and power consumption. Poor QoS could be as a result of poorly designed handover scheme which yields Signaling traffic. Cellular communication system is divided into cell of disjoint subset of frequency bands to avoid co-channel interference therefore, handover is needed. So, negotiation continues among mobile station, potential new base station and old base station. The aftermath of handover in mobile communication is enormous. An ineffective handover causes problems like poor Quality of service, poor utilization of bandwidth, call blocking, system overload, packet loss, and call termination.

The main goal of this research is to propose a database system for the analysis of handover mechanism in communication research issues and developing schemes which can handle handover traffic in order to support on-going calls when mobile user equipment switching between base stations.

2. Handover

Handover is of divers classes, includes other sections of the network. When user equipment changes cells within the same base station, it is not as complex as when the cell of different MSC. The reasons for this type of handover is mainly to ensure good quality of service. When the user equipment moves out of the coverage zone of the base station or the antenna of base station respectively. Another reason is, if the MSC or BSC decides to load shade due to high traffic on its cell. The need to engage another cell with lower traffic becomes a necessity. Handover is grouped based on either the access technology or protocol layers involved or type of technology supported by network or type of initiating and assisting entities.

i. Classification Based on The Access Technology

Classification Based on The Access Technology are of two types; Horizontal Handover and Vertical Handover. Horizontal Handover is often referred to as the Intra-technology handover because it deals with handover among Base stations of the uniform network interface. For instance, a handover between a 2 G base station and another 2 G base station or between a base station and another 3G base station. Horizontal Handover is peculiar with a homogeneous system such as Global System of Mobile communication, GSM and Code Division Multiple Access, CDMA based network.

Vertical Handover often referred to as inter-technology handover which takes place among two networks of different technology for example, or 3G and 4G. Vertical handover procedure cannot be successfully completed, unless both layer 2 (Data Link layer) and layer 3 are involved in the handover process [1] see figure 1.

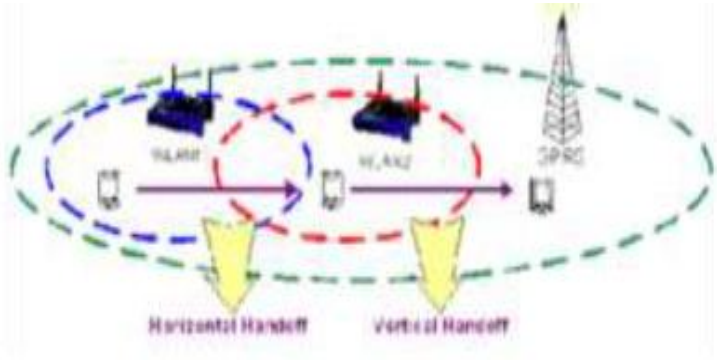

Figure 1: Horizontal and Vertical Handover

ii. Classification Based on The Protocol Layers Involved

Classification Based on the Protocol Layers Involved are of three types; Data link layer-Based handover, Network Layer-Based handover and CrossLayer-Based handover.

iii. Classification Based on The Type of Technology Supported By Network

Classification Based on The Type of Technology Supported by Network are of two types; Hard handover, soft handover and Softer handover.

Hard handover is such that the handover mechanism permits a gap in communication that leads to non-simultaneous communication of the user equipment among the new and old access points, during this process a serving station is released prior to new resources being committed.

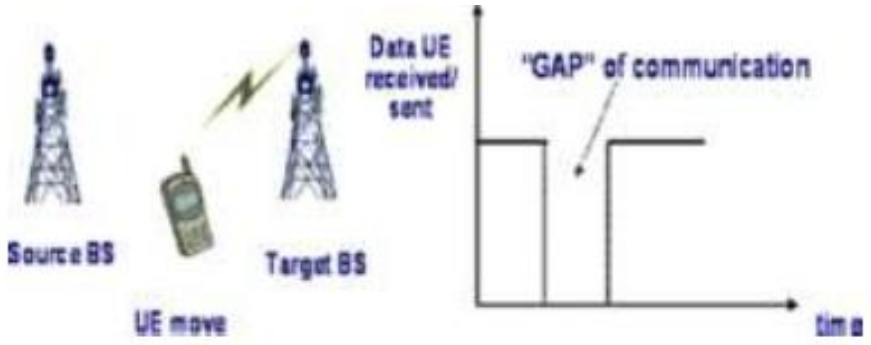

Figure 2: Hard-Handover Mechanism

Soft Handover, in Soft handover mobile connection between the user equipment with neighboring new Base Station is first established, prior to the release of the formal base station. This technique of handover reduces failure in connection, in that connection is established before breaking away from the old. In the Soft handover participating cells are synchronized. In the synchronization process, the MSC sends four HND_ACC messages of length one byte which contains the handover reference to the serving BTS. The BSC send the HND_CMD to initiate the Soft handover. The BSC HND_CMD the time slot and the new channel. The connection is established between the BSC and MSC by exchanging these messages. After these messages exchanged MSC receives HND_PREF message that the handover is performed by the BSC and then BSC requests BTS to release the resources that is no longer used. It often gives a Fast Base Station Selection (FBSS) and saves resources.

Softer Handover, there is much similarity between soft handover and softer handover because they are both frequencies change based handover, just that in softer hand takes place in between two different sectors of the same cell. The change in frequency happens when there is degradation in the quality of the communication link and the quality of service of the neighboring cell is better than the cell in use. In this case, the BSC which controls the BTS serving the MSC instructs the MSC and BTS to switch to another frequency which provides better communication link for the call. The communication link degradation is caused by the interference as the neighboring cell using the same frequencies and it's better to try another channel.

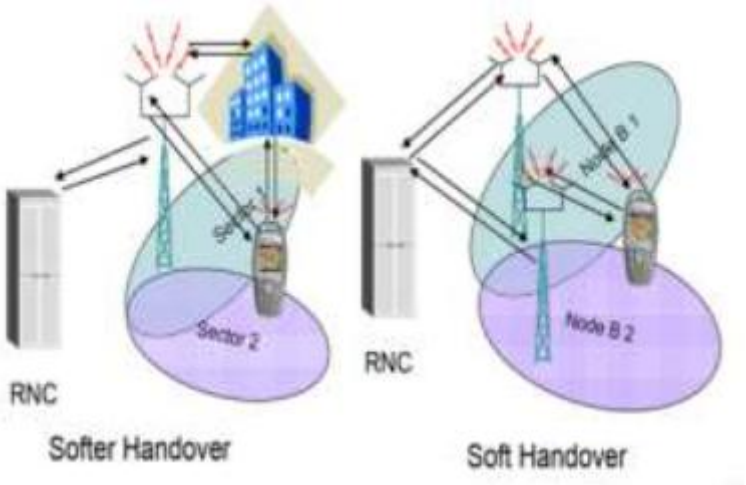

Figure 3: Soft and Softer Handover

iv. Classification Based on the Type of Initiating and Assisting Entities.

The case of this section is where the handover initiates the handover from and where controls the handover process. It could be Mobile Initiated based Handover (MIHO) or Network Initiated based Handover (NIHO) or Network Controlled based Handover (NCHO) or Mobile Controlled based Handover (MCHO) or Mobile Assisted based Handover (MAHO) or Network Assisted based Handover (NAHO) [2].

3. Review of Handover Techniques Based on History

Cheng *et al*., [3], whose study was based on a novel user mobility model to approximate simulation the laws of user mobility actions. They employed a history-based handover prediction approach to develop a user mobility database to assist the mobility prediction based on the historical records of the user mobility. The results of the simulation of this technique show that minimum number of handovers and lower ping-pong rate are achieved in LTE systems therefore, user mobility handover management becomes an important research area. Mobility of users with seamless accessibility and without the need to care about the underlying topology is the very source of many challenging issues. There are several management tasks that are deeply influenced by the user's mobility pattern. To guarantee a seamless service accurate estimation of user's future location is of paramount importance hence mobility prediction is considered as an effective technique for fast and seamless handovers. Roy *et al*., [4]; Cheng *et al*., [3] presented statistical analysis for efficient handover preparation based on cross-layer optimization and algorithms for complex pattern detection. This incorporates movement predictions in addition to classical handover preparation and triggers.

4. Data base Handover Management

This is a system of hand over management whereby the user's movement at intervals are sent as updates to the database by network at the appropriate time. The network automatically updates data by adding or clearing the route and cells at regular intervals or by unscheduled event trigger. Completing mobility pattern is decided at the network side, this means that it does not need interaction between the user and network. For instance, the information of the handover can include the location of the previous cell. From the location of the user, the network can make use of the lookup table to search a route to match the route of the current user from the database.

5. Conclusion

In this paper, handover techniques have been discussed in details. The several functional network elements and their dedicated channels associated with the handover process. The paper detailed the necessary procedural handover processes of initiation, decision and execution. The handover types and its roles in maintaining the quality of service in a call. It is worth noting that QoS in mobile communication is tied mostly to how fast and successful the handover is carried out. A thorough survey and analysis of the handover prioritization schemes that is guard channels, call admission control and handover queuing has been provided. In addition, this research indicates that different system uses different schemes to execute the handover mechanism for a couple of enhancements to the handover mechanism are introduced and discussed. The idea of the cells overlaps and load balancing scheme which tries to equalize the traffic over cells was discussed. In conclusion, the database analysis of handover has been found as essential in wireless communication network.

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