STUDY OF X2 HANDOVER IN LTE NETWORK USING MATLAB

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Abstract

This paper is demanded to study Handover Based on X2 Interface in LTE Network. Handover procedure in LTE Network has been intensely advanced when compared to the earlier 3GPP criteria. In this paper, the handover process describes takes the proficiency of communication networks in possession the communication link is working. In unusual, X2 handover is obtainable to let neighboring eNBs to keep the user mobility deprived of the contribution of the central network. X2 is an interface that must be spread when the manner of shifting data of time of handover between two eNodeB contiguous sectors in LTE. The capacities of interface X2 also manipulate of the time on handover process, so it is required to examine the function of interface X2 when handover occur between eNodeB in LTE. This paper learns the operation performance of the X2 handover from the UE perspective.

Keyword: X2 handover, RSRP procedure

1.INTRODUCTION

Occasionally, when you are looking internet in your car/bus, the internet is slower or even separate because 3G networks reportage cannot cover greatly while you are moving at high speed. Scientifically, this problem occurred because the handover/hand-off is malfunction. LTE as the next generation offers a lot of features such as a very high data speed and low transfer delay which let the user to use many application instantaneously without any disconnection and buffering although the user travels with very high speed movement. Long term evolution (LTE) is the succeeding generation after Universal Mobile Telecommunications System (UMTS) system which developed by 3GPP announcement 8. LTE as the fourth generation offers a high transmission speed and high mobility to the user. Mobile data continuous improvement appears efficient technologies to sate the needed quality of service (QoS) of the new services. Mobility is a one of the significant structures of current and next generation cellular systems that permits the users to modify purely their point of attachments while using their data and voice services. Handover in Long Term Evolution (LTE), as in earlier creation of cellular systems, is a technique to handover a user equipment (UE) and its circumstance from a source progressed NodeB (eNB) to a goal eNB. It requirements efficient handover decision algorithms in order to increase both UE and network performance and quality. Handover is a "UE-assisted network-controlled" process in that the quantity is designated by UE, and the decision is arranged by the network, i.e. eNBs and/or Mobility Management Entity (MME). Several works have been done competing the S1 and X2 handover in terms of the EPC signaling load and the outcomes evidences that X2 handover can decrease EPC signaling load more than six times compared with S1 handover. X2 handover can be a sort of resolution to reduce the capacity influence to the EPC and to increase the dependable arriving handover [1], [2]. In adding, it exposes that the X2 handover producing time decreases with the increase on the eNB communication power and vehicle speed using RSRP standard on the MATLAB platform [3]. This paper will effort on X2 handover in LTE that happens between eNBs [4]. In most of the events, both source and target eNBs are linked to the similar MME and are situated in the identical tracking area (TA). The capacity belongings cover the handover are placed in the same tracking area (TA). The measurement events cover the handover between two cells complementary the X2 interface between the eNBs.

2.LTE ARCHITECTURE

The network architecture of LTE is intended to be a wholly packet switched network based on IP. The LTE system architecture is included of two main components; the Evolved Universal Terrestrial Radio Access Network (E-UTRAN) and the Evolved Packet Core (EPC). EUTRAN is the air interface of the network. Its accountabilities contain management of radio access and providing user and control-plane maintenance to the users. EPC is the essential part of the network and it is responsible for mobility management, policy management and security. In order for LTE services to be offered to a user over the LTE network, an end-to-end (E2E) LTE network reference model (NRM) is proposed, containing of LTE entities and EPC entities. In the following, Table 1 and Table 2 illustration the functions of the LTE and EPC entities. Table 3 presents a description of interfaces between EPS entities [5].

Entity	Type
UE	A User Equipment links to eNodeBs above LTE-Uu Interface.
eNodeB	Offers user with radio interfaces and makes Radio Resource Management (RRM) tasks such as Radio Admission Control, eNodeB Measurement Configuration Control.

Table 1. LTE Entities

Entity	Type
MME	A Mobility Management Entity is the core control entity for E-UTRAN. It's agreement user authentication and user profile download, EPS Mobility Management and EPS Session management.
S - GW	Serving – gateway Terminates the interface regarding an EUTRAN. It performs as local fact for data connection for inter – eNodeB (Intra E-UTRAN).
P- GW	Packet Data Network (PDN) Gateway provides a UE with admission to PDN by assigning an IP address from the address space of the PDN. The P-GW reliable for handover between 3GPP and non 3GPP systems (Inter RAT).
HSS	Home Subscriber Server is the vital Database where user profiles are warehoused. Offers user authentication and user profile download for MME.

Table 2. EPC Entities

Entity	Type	
LTE - Uu	An interface for control/user plane between UE and eNodeB.	
X2	An interface for control/user plane between two eNodeB also handled for X2 handover	
S1	S1 - U	An interface for user plane between eNodeB and S - GW.
	S11	An interface for control plane between eNodeB and S - GW.
	S1 - MME	An interface for control plane between eNodeB and MME.

Table 3. LTE Entities

3.LTE HANDOVER

3.1. Overview

The handover process provides transferring a related user's session from a base station to another base station without disconnecting the session. Handover is an important idea in mobile networks. The system need provide mobility to the users reliably and without dropping any of their calls /losing their data. In mobile networks, there are two kinds of handover, hard and soft. In hard handover, the user disconnects from the source cell afore connecting to the target cell. In soft handover, the user connects to the target cell afore disconnecting from the source cell. In LTE, only hard handover is maintained. According to the characteristics of the source and target cells, there are two categories of handover defined in LTE. These are:

- Intra E-UTRAN: In Intra E-UTRAN handover, handovers are presented between eNodeBs in LTE network. Handovers can be prepared over S1 or X2 interface.
- Inter RAT (Radio Access Technology): In Inter RAT Handover, handovers are performed between E-UTRAN and other 3GPP radio admission technologies.

In this paper we measured only intra E-UTRAN X2 handover.

3.2. X2 Handover Procedure

The handover procedure can be general in three phases. These phases are; handover preparation, handover execution and handover completion.

3.2.1. Handover preparation

The steps of the handover preparation phase are:

- The UE leads a measurement report to its serving cell.
- The serving cell takes if the user needs to do handover and classifies the target cell.
- The serving cell determines the interface that will be used in handover, then refer a Handover Request message to the target cell.
- If the target cell receives the request, it assigns the required resources for the UE and sends a Handover Request Acknowledge message to the source cell.
- The Handover Request Acknowledge message involves an *RRC-Connection-Reconfiguration* message.

3.2.2. Handover execution

The stages of the handover execution phase are:

- The source cell ahead the RRC-Connection-Reconfiguration message to the UE.
- The source cell forwards user data packets to the target cell with using X2 or S1 interface allowing to the interface consumed in the handover.
- After accepting the RRC-Connection-Reconfiguration message, the UE announces the resources of the source cell, harmonizes with the downlink of the target cell and efforts to access the target cell with using the random access procedure.
- If the UE can access the target cell, it suites a secure link and sends an *RRC-Connection-ReconfigurationComplete* message to the target cell to approve the handover.

3.2.3. Handover Completion

The steps of the handover completion phase are:

- After obtaining the *RRC-Connection-Reconfiguration-Complete* message, the target cell sends Path Switch Request message to the MME.
- After obtaining the Path Switch Request or Handover Notify message, the MME tells the S-GW about the alteration in the data path of the UE. The source UE receives UE Context Release message, upon obtaining these messages the source cell can release the resources for the UE.

4. SOLUTION ARCHITECTURE

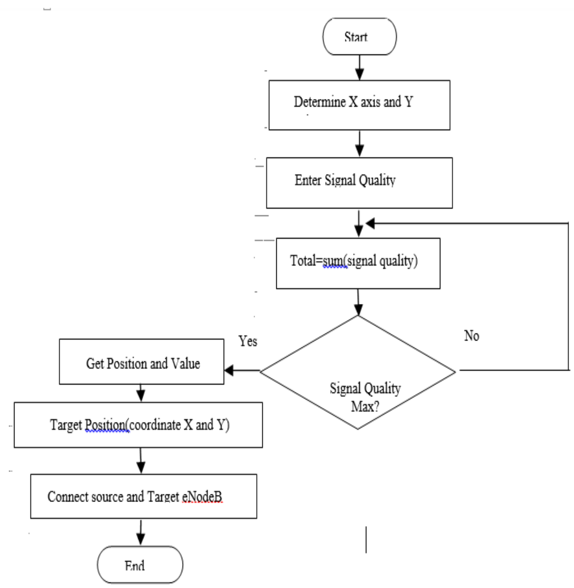

Figure 1. Cell Search Procedure in X2 Interface of Flow Diagram

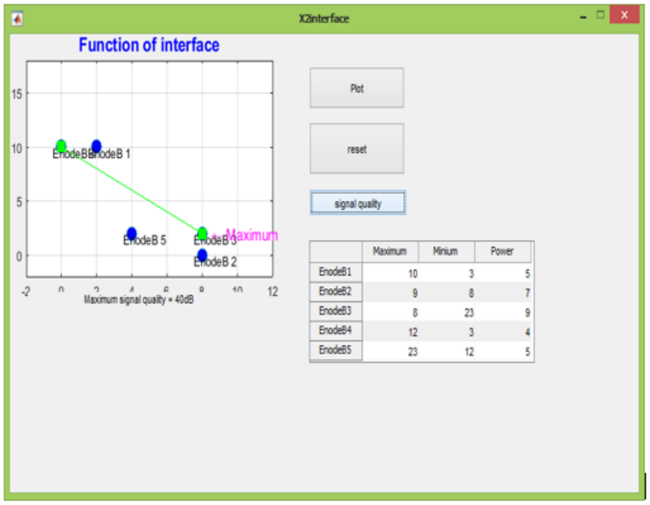

Figure 2. Position of EnodeBs and Signal Quality of Maximum and Minimum

When clicking the plot button, the location of EnodeBs emerge. And then click signal quality from this EnodeBs, the point two EnodeBs with maximum signal quality will present in Figure 2.

According the signal quality value of EnodeBs, this value is calculated by RSRP. After the calculation, the result of signal quality value is get. Adding the maximum and minimum signal quality and then the outcome is greater than zero, handover is completed. After Handover, UE is attached to the target eNodeB. Otherwise, if the result is not greater than zero, handover is not completed.

5.CONCLUSIONS

The recent X2 interface approaches a ways for distribution information between neighboring eNodeBs to develop handover and to reduce interconnected intervention. The X2 carries both control plane signaling and progressed user plane data, and the last rulings the bandwidth necessity. Supplier attitudes vary, but most study that 5% of the S1 bandwidth is a large grant for the X2. The S1 bandwidth itself depends on the operating bandwidth and MIMO arrangement of the eNodeB it works. Further studies have presented a typical 10MHz 2x2 downlink which needs a total of around 30-40 Mbps of backhaul per tri-cell eNodeB during busy times. This figure involves S1, X2 and transport protocol overheads.

When the user practices data, the X2 inserts delay to the overall budget, and so low latencies are highly desired. In the future, LTE-Advanced involves a capacity-enhancing technique so-called Co-ordinated Multipoint Transmission and Reception. It has been shown that even reasonably small latencies of 5ms can reduce the gains of such schemes expressively.

Neighboring eNodeBs are approximately covered by the same multipoint sector, which allows rapid turnaround of the X2 traffic. PMP networks form a hub-and-spoke topology, which is much better suited to X2's peer-peer connectivity than the tree topologies fashioned by PTP networks.

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