STUDY OF LTE X2 HANDOVER ALGORITHM

Be Nue[1], Khin May Yee[2], Sabai Win[3]

[1] *Faculty of Information Science, University of Computer Studies, Myitkyina and 1011, Myanmar*
[2]*Information Technology, Technological University Meiktila and 05181, Myanmar*
[3]*Faculty of Computer Systems and Technologies, University of Computer Studies, Myitkyina and 1011, Myanmar*

Abstract

Handover process in LTE has been deeply progressed when competed to the earlier 3GPP standards. In particular, X2 handover is presented to accept eNodeBs to switch the user mobility without the connection of the core network. However furthermost of the usage could significantly value from the X2 handover performance enhancement, delay breakdown and consequence of parameters from the UE perspective are not well examined. The handover process expresses decides the ability of communication networks in retaining the communication link is working. X2 is an interface that must be spread when the manner of shifting data of time of handover between two eNodeB adjacent sections in LTE. The occasion on handover process is also operated by the aptitudes of X2 interface, so it is necessary to examine the function of interface X2 when handover occur between eNodeB in LTE. This paper study the execution of the X2 handover from the UE perspective. Furthermore, the handover decision algorithm investigates the impact of the different parameters.

Keyword: X2 handover, RSRQ and RSRP algorithm

1.INTRODUCTION

Mobile broadband services are rising speedily in line with the increasing request for telecommunication network access services. Cellular technology advanced from GSM / GPRS / EDGE (2G), UMTS / HSPA (3G), and LTE technology. LTE is the modern typical in mobile network technology than the others. Currently LTE has ongoing to develop and its progress is still continuing until now. LTE technology is fairly new in one of the objectives of this technology is to generate a smooth mobility system [1]. Mobility proficiency is one of the vital Key Performance Indicator (KPI) on the network with this technology. Mobility here is the capacity of a mobile device to link with other mobile devices in a public of motion. X2-based handover involves mobility capabilities on LTE networks. The handover here is the same as the handover on the former generation technology, which is the movement of the User Equipment (EU) in this situation from evolved NodeB (eNodeB) that operate to the target eNodeB. This occurs because the feature of the eNodeB network that serves lesser than the target eNodeB.

Handover occurs launch with the measurement process informed by the EU, then the decision is built by the network ie eNodeB and or Mobility Management Entity (MME). In the LTE network, eNodeB links with the EU over the air interface, and connects to the EPC (Evolved Packet Core) via the S1 interface and connects to the nearby eNodeB via the X2 interface [2]. The handover through the X2 interface is normally termed the X2-based handover. On a X2-based handover after getting the measurement report, the serving eNodeB may determine to propose the mobile device to another cell. X2-based handover includes center position fluctuations using message signaling via X2 interface, but no gateway deviations serving or MME [3]. In a previous study [4] researchers calculated the handover performance of LTE networks using RSRQ and RSRP algorithms. Based on this reasons the researchers are determined to research on parameter handover base X2 by estimating the network that has been built by taking examples of one of the LTE network possessed by one of the Provider. Handover routine optimization is applied using two algorithms namely RSRP and RSRQ. The parameters of the RSRP algorithm to be adjusted are Time-to-Trigger (TTT) in units of time (ms) and Hysteresis in dB units, whereas in the RSRQ algorithm to be adjusted are the Serving Cell Threshold parameters in dBm and Neighbour Cell Offset in dB.

2. BACKGROUND THEORY OF LITERATURE SURVEY

2.1. Long Term Evolution

Long Term Evolution (LTE) is one of the properly original principles in mobile network technology compared to GSM / EDGE and UMTS / HSPA. LTE is a original name of a highly mobile service that is a stage near the 4G generation of radio technology intended to rise the capability and speed of mobile phone networks. LTE is a plan in the Third Generation Partnership Project (3GPP). In continuing the technological progress of the GSM and UMTS technology family in 3GPP, the LTE system can be perceived as completion of the service delivery expansion movement past voice calls to multiservice air interface. This has been the core goal of UMTS and GPRS / EDGE, but LTE was designed from the beginning with the goal of evolving radio access technology assuming that totally services will be packet switched, rather than following the previous circuit-switched System model [5]. Moreover, LTE is attended by the evolution of non-radio characteristics of a whole system, with the period System Architecture Evolution (SAE) covering the Evolved Packet Core (EPC) network. Together, LTE and SAE comprise of the Evolved Packet System (EPS), where the core network and radio access are totally packet-switched.

2.2. Handover Intra LTE

There are two kinds of handover procedures in LTE for EU in effective mode: S1 handover procedures and X2 handover processes [5]. For intra-LTE mobility, X2 handover procedures are usually used for inter-eNodeB handover. However, if there is no X2 interface between two eNodeBs, or if the eNodeB source has been arranged to start handover to a exact eNodeB target via the S1 interface, then S1 handover will be activated.

2.3. Handover Based X2

Handover via X2 interface is triggered by defaulting without no X2 interface is formed or eNodeB source is configured to use S1 handover in its place. The handover procedure X2 is explained in Figure 1. Handover X2 comprises of the preparatory phase (steps 4 to 6), the execution phase (steps 7 to 9) and the completion phase (after step 9).

The central feature of X2 handover for intra-LTE proposal is [5]:

1. Handover is completed directly between two eNodeBs. This creates the preparation phase fast.
2. Data forwarding can be functioned per bearer to minimize data loss.
3. MME is just informed at the end of the handover procedure after the handover prospers, to trigger the switch path.
4. Resource reliefs on the source side are straightforwardly triggered from the eNodeB target.

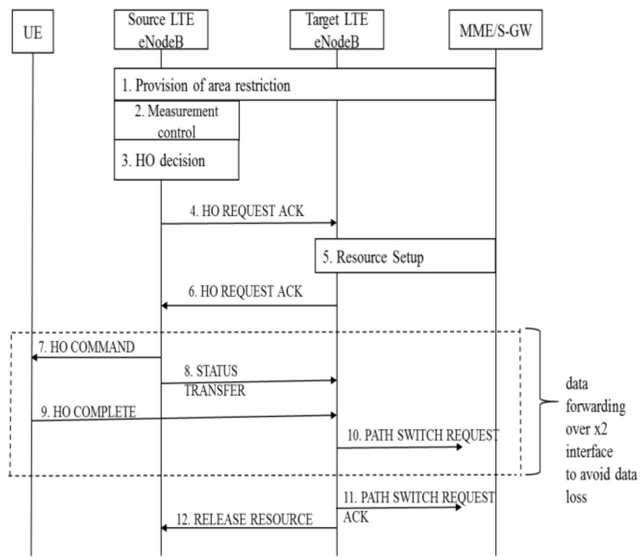

Figure 1. The handover process X2 [5]

2.4. RSRP and RSRQ

RSRP and RSRQ are two kinds of measurement in LTE. These measurements are outlined in 3GPP [6]. In LTE system, there are two manners of measurements. The measurements calculate the signal power and the signal quality. The signal quality is RSRQ, while The signal power is known as RSRP. RSRP is acronym of reference signal received power, while RSRQ is reference signal received quality. RSRP is stated by PHY layer in dBm while RSRQ in dB. These measurements are done by the UE when UE desire to move from one eNodeB to

another eNodeB, well-known as handover. Throughout the movement process, UE calculates the reference signal from serving eNodeB and neighbor eNodeB.
The UE will conduct the measurement report behind to the serving eNodeB cooperatively with the physical cell identity (PCI) of the cell. PCI is taken with the Primary Synchronization Signal (PSS). The PSS is delivered by the eNB each 5 sub frames and in detail in the sub frames 1 and 6. The report is exhausted by the eNodeB to determine when handover should be triggered so that UE can shift to the neighbor eNodeB. Ideally RSRP is reference signal receive power. RSRP survives a RSSI type of measurement. It determines the average received power over the resource elements that take cell-specific (RNTI) reference signals (RS) inside certain frequency bandwidth. RSRQ is a C/I type of measurement and it designates the quality of the received reference signal. It is expressed as

$$RSRQ = \frac{N*RSRP}{RSSI} \quad (1$$

The average totalize received power observed just in OFDM symbols including reference symbols for antenna port 0 (i.e., OFDM symbol 0 & 4 in a slot) is measured by the carrier RSSI (Receive Strength Signal Indicator) in the measurement bandwidth above N resource blocks. The total received power of the carrier RSSI comprises the power from co-channel serving & non-serving cells, neighboring channel interference, thermal noise, etc. The RSRQ measurement supports extra information when RSRP is not adequate to make a reliable handover or cell re-selection decision. In the procedure of handover, the LTE measurement supports the flexibility of using RSRP, RSRQ, or both.

3. IMPLETATION OF PROPOSED SYSTEM

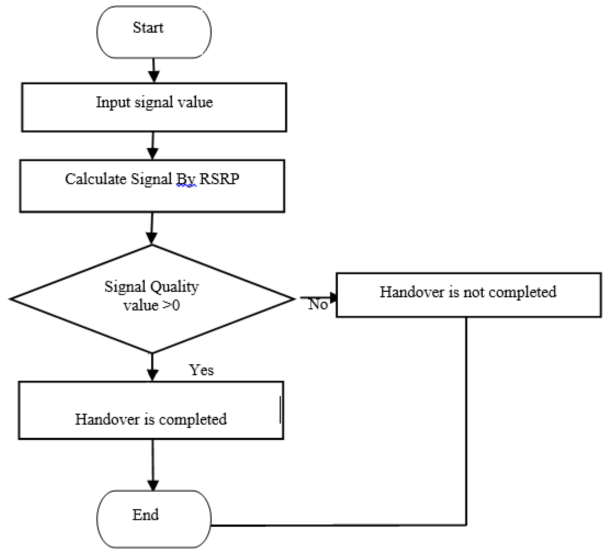

Figure 2. Flow Chart of Handover based on X2 Interface

Figure 3. Input the Maximum Signal and Minimum Signal Quality

Figure 3 displays the parameter calculation. It can be presumed that maximum signal quality is 5 and mini signal quality is 6. The power is overlooked. If the result is larger than zero, the handover is completed message box is showed. This is displayed in Figure 4.

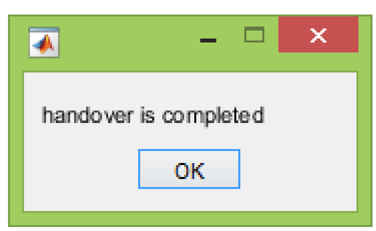

Figure 4. Handover completed message frame

After Handover, UE is close to the target eNodeB. If the target eNodeB's signal quality >0, handover is completed. Then, the data and voice signal can be transmitted. This sending data signal is displayed in Figure 5 and the sending voice signal is shown in Figure 6.

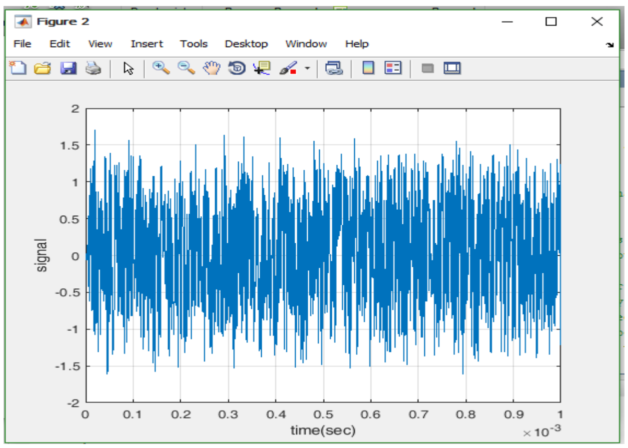

Figure 5. Data Signal

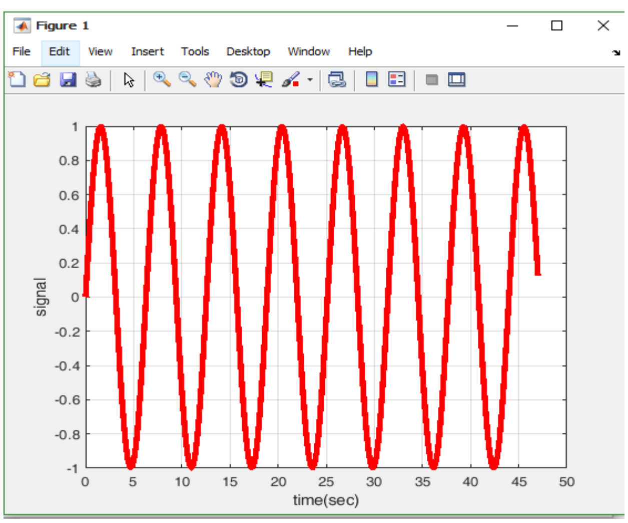

Figure 6. Voice Signal

Figure 7 shows the parameter calculation. It is expected that maximum signal quality is -5 and mini signal quality is -2. The power is unnoticed. If the result is lesser than zero, the handover is not completed message box is displayed. This is shown in Figure 8.

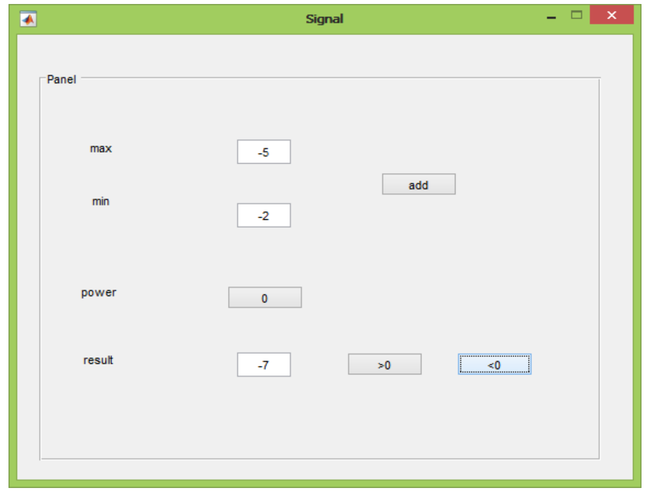

Figure 7 .Input the Maximum Signal and Minimum Signal Quality

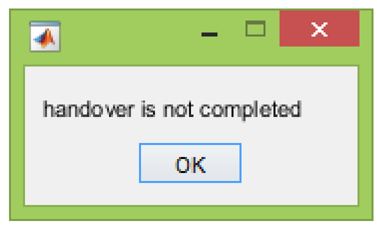

Figure 8. Handover not completed message frame

If the target eNodeB signal quality <0, handover is not completed. And then the signal is dropped. The dropping signal is displayed in Figure 9.

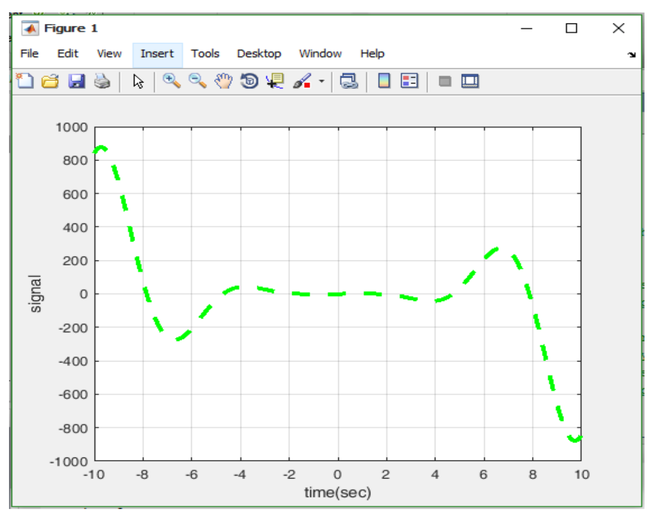

Figure 9. Dropping Signal

4. CONCLUSIONS

The X2 carries together control plane signaling and progressed user plane data, and the latter decrees the bandwidth necessary. The new X2 interface submits a paths for distribution information between neighboring eNodeBs to improve handover and to decrease associated intervention. Vendor opinions change, but most study that 5% of the S1 bandwidth is a huge grant for the X2. The S1 bandwidth itself varies on the operating bandwidth and MIMO arrangement of the eNodeB it works. More studies have shown a usual 10MHz 2x2 downlink which needs a total of around 30-40 Mbps of backhaul per tri-cell eNodeB in busy times. This figure incorporates S1, X2 and transport protocol overheads.

In the upcoming, LTE-Advanced incorporates a capacity-enhancing technique termed Co-ordinated Multipoint Transmission and Reception. When the user consumes data, the X2 enlarges delay to the overall budget, and so low latencies are greatly desirable. It has been shown that even relatively small latencies of 5ms can decrease the gains of such schemes pointedly.

Adjacent eNodeBs are closely covered by the same multipoint sector, which allows rapid turnaround of the X2 traffic. PMP networks form a hub-and-spoke topology, which is abundant superior suited to X2's peer-peer connectivity than the tree topologies designed by PTP networks.

5. ACKNOWLEDGEMENT

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