Research Article

Soft Mobility: Transparent Handover with Zero Handover Failure in User-Centric Networks

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User-centric network (UCN) is regarded as a promising candidate to approach the challenges of more radio link failures (RLFs) due to the ultradense deployment of small base stations (SBSs) and meet the requirements of ultrahigh throughput, ultrahigh reliability, and ultralow latency for the 6G system. In this paper, soft mobility is proposed for UCN with the split of control and user plane (C/U-plane) and shared physical cell identifier (PCI) to achieve the goal of zero handover failure (HOF) probability, where transparent handover (HO) within a cell is realized with user configuration duplication and measurement enhancement. Specifically, the cell is composed of several SBSs around the user, where one anchor SBS is selected for controlling, and others act as slave SBSs for transmission with duplicated UE configuration from the anchor SBS. Based on the proposed architecture, the user measures downlink channel quality for cells and SBSs distinguishingly, via SS/PBCH Block (SSB) and channel-state information-reference signal (CSI-RS), respectively, and then makes the HO decision. Results show that soft mobility can reduce the number of HOF by about 50% over the current system, and the HOF probability is lower than 1% for TTT = 40 ms and offset = -1 dB.

1. Introduction

Ubiquitous wireless access is one of the prominent features in six-generation (6G) wireless communication networks, so the number of Femto Access Points (FAPs) will grow exponentially in order to address the high traffic demands caused by more and more smart devices [1]. Ultradense networks (UDNs) are regarded as one of the most significant technologies for the fifth-generation and beyond. However, the increasing number of small cells may cause frequent handovers and degraded mobility robustness [2]. So the crucial topic is proposed in the 6G network which is user-centric network (UCN).

The philosophy of UCN is introduced to deal with the strong interference and frequent handover (HO) in UDN [3–5]. UCN breaks through the network-centric cellular architecture and consequently provides senseless movement for user equipment (UE), which is regarded as a promising candidate to meet the requirements of ultrahigh throughput, ultrahigh reliability, and ultralow latency for the 6G system

[6–8]. However, the mobility management requires more considerations for UCN when a cluster of cooperating small cells appears to UE as a single cell.

The proposed soft mobility for UCN is aimed at reducing radio link failures (RLFs) due to the ultradense deployment of small base stations (SBSs) and reducing the HOF probability to zero. Through user configuration duplication and measurement enhancement, transparent HO within SBSs groups is realized, where the configuration of physical (PHY) layer parameters is transparent between a set of SBSs; thus, no reconfiguration is needed for HO. In this paper, the architecture of UCN with the split of control and user plane (C/U-plane) is proposed, and the concepts of the anchor SBS and the slave SBS are introduced, and SBS-level mobility procedure and cell-level mobility procedure are also designed correspondingly. The main contributions of this paper can be summarized as follows:

- (i) The architecture of UCN with anchor and slave SBSs is proposed for providing transparent handover.

Compared to 5G system where the responsibilities of each SBSs are independent and roughly the same, in this work, a certain number of SBS sets will be formed and divided into anchor SBSs and slave SBSs which have different responsibilities in the process of handover and transmission. Anchor SBS with strong capability acted as a handover anchor and its neighboring SBSs are slave SBSs

- (ii) Mobility management procedures are redesigned for SBS-level and cell-level handover. Different from the mobility procedure in the 5G system, it is needed to redesign the handover procedure separately when UE changes the slave SBS and anchor SBS, including SBS-level mobility procedure and cell-level mobility procedure, and transparent handover between slave SBSs is realized with user configuration duplication and measurement enhancement
- (iii) UE-controlled mobility management is applied for its scalability instead of network-controlled mobility management. That is because UE can get better aware of the surrounding wireless communication environment, and fewer measurement reports are needed
- (iv) The simulation results verify the superiority of the proposed architecture and mobility management procedures. Furthermore, the effect of system parameters (such as UE velocity, BS densities, time-to-trigger, and offset) on handover, handover failure, and throughput is analyzed, which could provide guidance for actual network planning in 6G systems

This paper proposes a soft mobility model for UCN to reduce the number of HOs and handover failures (HOFs) without extra resource occupancy of dual connectivity (DC), where multiple SBSs around UE form a cell for transparent handover. Simulation results showed that better performance on delay, signal overheads, and HOF reduction is achieved in the soft mobility scheme proposed.

The rest of the paper is structured as follows. Section 2 introduces the previous related work and compares the scheme proposed in this paper with the previous work. Section 3 illustrates the network architecture and mobility management events. Section 4 describes the formulation models involved in the handover process. Section 5 explains new designs for soft mobility which are needed to support the procedures. And mobility procedures are detailly presented in Section 6. Numerical results and explanations are shown in Section 7. Finally, Section 8 concludes this paper.

2. Related Works

Considering the dense deployment of BSs, [4, 9, 10] analyze the handover performance theoretically. The negative effect of channel fading and the overhead of handover on mobility performance in UDN are analyzed in [9, 10], respectively. Poor mobility performance under dense SBSs deployment

and performance gain of UCN architecture is confirmed in [4, 9] through theoretical results without specific network architecture design. HO management strategies are proposed in [11–14] to reduce HO and HOF in UDN at the cost of spectrum resources [11] or high computational complexity [12–14], which lack implementability. The specific mobility implementation scheme for UCN needs to be designed.

Recent studies investigate the mobility performance with the formation of cooperating SBSs, which shows that the HO reliability is improved. A softer HO scheme is proposed in [15] with DC for cell-edge users, which enables fast HO by duplicating control messages. However, the mobility improvement comes at the expense of more signal overheads between each serving-target cell pair. Further, local anchor-based DC is applied in UCN in [5], which achieves a remarkably decreased HOF rate without increasing control overheads. By synchronizing the multiple SBSs in the same cluster, the selected anchor SBS will manage the HO within the cluster which only requires few procedures. However, DC will occupy extra resources of the SBSs, which reduces resource utilization rate and causes more frequent HO events due to the additional transmission link for robustness. How to design a low signaling overhead mobility management scheme in UCN is still an open problem.

It would be useful to generalize the anchor-based architecture and the method of configuration duplication to mobility enhancement in UCN. However, in UCN, the measurement for SBSs and cells should be distinguished [16]. Especially, SBS-level and cell-level measurements and decisions are implemented with channel-state information-reference signal (CSI-RS) and SS/PBCH Block (SSB), respectively.

3. Network Architecture for Soft Mobility Enhancement

UCN makes the user feel like the network is always following it, and the network intelligently recognizes the user's wireless communication environments and then flexibly organizes the required cell group and resource to serve the user. Inspired by this, a UCN architecture that supports soft mobility is presented in this section to realize transparent handover.

3.1. Network Architecture. In this section, the architecture of UCN with the split of control and user plane (C/U-plane) is introduced, as shown in Figure 1, which naturally supports the features of soft mobility in terms of transparent handover [16]. Several SBSs around a user form a cell to provide user-centric coverage. The anchor SBS is selected for the C-plane, which in a way operates as a gateway in the system by terminating the signaling and data plane between other SBSs (terms as slave SBS) and the core network. The number of SBSs in a cell is set by the network operator, and the SBS with the largest load capacity in the cell is selected as the anchor SBS because the anchor SBS is expected higher capacity. The other SBSs around the user provide the U-plane as slave SBSs.

FIGURE 1: Soft mobility model and network architecture.

FIGURE 2: The protocol stack in the UCN.

3.2. Protocol Stack. The design of U-plane protocol stack 3C is applied for the two-layer UCN architecture, shown in Figure 2, where the anchor SBS and its slave SBSs share the protocol data unit (PDU) of packet data convergence protocol (PDCP) layer, while the radio link control (RLC) and medium access control (MAC) are independent as mentioned above. With the downlink measurement result on CSI-RS, the proper SBS for transmission can be selected dynamically.

On the other hand, one of the slave SBSs provides data service for the UE acted as the transmission node and the RLC, MAC, and PHY layers of the slave SBS and the anchor SBS are independent. So when the service transmission node changes, the terminal only needs to reconfigure the parameters of the RLC and MAC layers.

3.3. Mobility Management for Soft Mobility. Under the proposed architecture, mobility management events should be redesigned for soft mobility. As shown in Figure 1, there is an example of the user moving trajectory and 3 types of mobility management events are included.

(i) *Initialization.* In the beginning, the UE is at the beginning of the trajectory; then, the SBS with the largest load capacity among the SBSs around the user is chosen as the anchor SBS, and then, a certain number SBSs are chosen as the slave SBSs, and anchor SBS provides data service at the beginning as it provides maximum reference signal receiving power (RSRP) among the slave SBSs.

(ii) *SBS-Level Handover.* A SBS-level handover is triggered when the RSRP from another SBS is stronger than serving SBS due to the user's movement and the SBS is in the set of slave SBSs.

(iii) *Cell-Level Handover.* As the UE moves, it became farther from the anchor SBS. When the signal from SBSs in the current cell is unable to satisfy the A3 entering condition, cell-level handover is needed.

The proposed soft mobility model is aimed at achieving transparent HO and senseless movement for mobile users. With duplicated UE configuration, the slave SBSs share physical cell identifier (PCI) with the anchor SBS within the same cell, so that there is no sense of changing cells for the user when the slave SBS is changed within the same cell.

4. Formulation Models

This section presents formulaic models for the soft mobility handover (HO), signal to interference and noise ratio (SINR), throughput, spectrum efficiency (SE), and handover failure (HOF).

4.1. Model for HO. As motioned above, several SBSs and a SBS near UE form slave SBS and anchor SBS service UE together, and the soft mobility scheme is different from the traditional scheme in the current system. A novel scheme for the soft mobility architecture is discussed in this subsection.

The UE needs to select a target SBS for SBS-level mobility and a target cell with a target SBS for cell-level mobility. Similar to event A3 [17], the HO decision should consider the RSRP and is made at t_0 if the following condition is fulfilled.

$$P_{t,u}^{\Theta} > P_{s,u}^{\Theta} + \text{Offset}^{\Theta} \text{ for } t_0 - T^{\Theta} < t < t_0, \quad (1)$$

where $\Theta \in \{\text{SBS}, \text{cell}\}$ denotes the SBS-individual or cell-individual parameters, $P_{t,u}^{\Theta}$ and $P_{s,u}^{\Theta}$ are the measured RSRPs of a neighboring SBS (or cell) and the serving SBS (or cell), respectively, Offset^{Θ} is the offset, and T^{Θ} is the time-to-trigger (TTT). It is worth noting that the $P_{s,u}^{\text{SBS}}$ is only measured from the slave SBS in the cell in order to achieve senseless movement.

Similar to the 5G system, the offset and TTT are designed to improve mobility robustness and reduce unnecessary handover and ping-pong (PP) effect. At the same time, the offset and TTT should not be configured too big, which may lead to not timely handover trigger and cause RLF afterward.

4.2. Model for SINR, Throughput, and SE. The RSRP from the neighbor SBS is measured periodically, in order to make handover decisions in time. A universal path loss-plus-fading model is used to describe the received signal power. So the RSRP received by UE u from SBS t is given by

$$P_{t,u}^n(d, t) = p_t^n g_t(d) h_t(t), \quad (2)$$

where p_t^n denotes the transmit power of SBS t at the subchannel n , $g_t(d)$ denotes the pathloss gain that only depends on the distance d between UE and SBS t , and $h_t(t)$ is the multiplicative channel gain at time t modeling the multipath fading effect.

Although slave SBSs logically serve UE together, the bandwidth is reused among the slave SBS in order to achieve high spectrum efficiency. So the UE will still be interfered by the other slave SBS. Then, the corresponding SINR of the UE u which connects with SBS s can be calculated as

$$\text{SINR}_{s,u}^n(t) = \frac{P_{s,u}^n(d, t)}{\sum_{j \in \Psi \setminus \{s\}} P_{j,u}^n(d, t) + \eta}, \quad (3)$$

where $P_{s,u}^n(d, t)$ denotes the signal received by the UE u from the serving slave SBS at the subchannel n , $P_{j,u}^n(d, t)$ denotes the interference received by UE u from other SBS at the subchannel n , and η is the white noise power.

By using (3) and Shannon capacity theory, the achievable data rate of UE u at the subchannel n is shown as follows:

$$C_u^n = W \log_2(1 + \text{SINR}_{s,u}^n), \quad (4)$$

where $\text{SINR}_{s,u}^n$ is the SINR of UE u at the subchannel n calculated by (4) and W is the bandwidth at the subchannel n . Therefore, the SE of UE u is calculated as follows:

$$\text{SE}_u = \frac{\sum_n C_u^n}{\text{BW}_u}, \quad (5)$$

FIGURE 3: An example for the maintenance of CSI-RS set.

where BW_u is the total bandwidth allocated to UE u . And after averaging the spectrum efficiency on all of the subchannel, we can get the SE of UE u .

4.3. Model for HOF. The SINR can evaluate the link quality, so it can be used to judge the HOF. According to the 3rd Generation Partnership Project (3GPP) specification, the handover failure model in state 2 can be summarized as follows:

- (i) The link quality becomes worse after the handover is triggered because of the user's moving, and the SINR decreases at the same time
- (ii) When the SINR is below a certain threshold, that is, Q_{out} during the TTT, handover failure is caused

So the HOF model can be expressed by

$$\text{SINR}_{s,u}(t) < Q_{\text{out}} \text{ for } t_0 - T^{\Theta} < t < t_0, \quad (6)$$

where handover is triggered at $t_0 - T^{\Theta}$, and T^{Θ} is the TTT.

5. Design for Soft Mobility

Given the above architecture, in order to support the procedures to be mentioned later, we have introduced some special designs for soft mobility. In this section, we explain the main three points of the design in detail.

5.1. UE Configuration Duplication. The process of the UE configuration can be expressed as follows:

- (i) The anchor SBS transfers both UE static configuration and UE running-time configuration to the slave SBS, so that slave SBS could act as a transmission point of the anchor SBS from the UE point of view.

FIGURE 4: SBS-level mobility management procedure.

That is because the anchor SBS and the slave SBS have the same PCI

- (ii) Both the anchor SBS and the slave SBS transfer the same L2 data to UE in a redundant way
- (iii) UE performs combination in L2 RLC layer

5.2. Measurement and Reference Signal. In order to make the decision on target SBS and target cell for intracell and inter-cell mobility, measurement configurations and related signaling are needed. Since a cell is composed of densely deployed SBSs, the set of SBSs within one cell and the set of neighboring cells to be measured should be different. The UE needs to obtain measurement results by measuring candidate cells and candidate SBSs wherein each cell includes multiple SBSs that share a common cell ID (see Figure 3).

For the proposed soft mobility model, the downlink measurements can be classified into two types:

- (i) **SBS-Level Measurement.** The UE measures downlink channel quality via CSI-RS and later reports to the anchor SBS after the UE makes the HO decision with proper SBS for SBS-level mobility.
- (ii) **Cell-Level Measurement.** It is based on the SSB which is sent to UE only when the serving SBS is changed to an edge SBS, or the UE is moving between edge SBSs.

In addition, adjacent UE transmits the UE-specific orthogonal uplink sounding reference signal (SRS) num-

ber, for the uplink channel estimation which can be measured by arbitrary slave SBSs. The slave SBSs are informed by the anchor SBS to monitor the SRS and then send the feedback to the anchor SBS. Based on the uplink measurement, in order to handle the SRS conflict, the slave SBS chooses its serving UE for SRS reconfiguration before the HO process.

5.3. Uplink and Downlink Channel. Different from the current system, the key characteristics of channel design are described as follows:

- (i) Enhanced physical downlink/uplink control channel (ePDCCH/ePUCCH) is applied instead of PDCCH/PUCCH for frame control/uplink control
- (ii) For the uplink channel, anchor-assisted physical random access channel (PRACH) takes over PRACH
- (iii) For downlink channel, anchor-assisted physical broadcast channel is applied for system information bearer

6. Procedures

Base on the proposed architecture, the handover management would be different from the current system. As both anchor SBS and slave SBS exist in the proposed architecture, two types of mobility management are correspondingly designed, which are SBS-level mobility procedure and cell-

FIGURE 5: Cell-level mobility management procedure.

level mobility procedure. This section gives detailed explanations of the procedures, which are described in Figures 4 and 5, respectively.

There are two places that can decide to change the serving SBS which are the UE and the network and are termed UE-controlled mobility management and network-controlled mobility management.

- (i) In UE-controlled mobility management, the UE estimates the channel quality from the neighboring SBSs or cells and determines mobility events
- (ii) In network-controlled mobility management, the SBSs decide and initiate the processes based on the measurement feedback information assisted by UE

This paper is concerned about UE-controlled mobility management for its scalability. When UE moves across the adjacent cells, cell-level mobility is needed, where not only a target cell but also a specific SBS in the cell needs to be identified.

6.1. SBS-Level Mobility Procedure. The key procedure of the SBS-level mobility procedure is shown in Figure 4. In the preparing phase, before the HO procedures, the UE must already have a radio resource control connection with the anchor SBS in C-plane and a SBS in U-plane which could be either the anchor SBS or slave SBS. The main procedure of the SBS-level mobility procedure is described as follows:

TABLE 1: Simulation parameters.

Parameters	Values
Carrier frequency	2 GHz
Bandwidth	10 MHz
SBS transmit power	30 dBm
Area of simulation	500 * 500 m ²
UE antenna height	1.5 m
Variance of white Gaussian noise	-174 dBm/Hz
UE density	1000 users/km ²
SBS density	180, 320, 500, 720, 980, 1280, 1620 SBSs/km ²
Number of SBSs in a cell	5
TTT	$T^{\text{SBS}} = T^{\text{cell}} = 320$ ms
Offset	Offset ^{SBS} = 1 dB, Offset ^{cell} = 3 dB
Q_{in}	-8 dB
Q_{out}	-6 dB
T_{RLF}	200 ms
T_{recovery}	100 ms

- (i) First, the RSRPs of the neighboring SBSs are obtained periodically by UE, and UE makes the handover decision when condition (1) is satisfied

FIGURE 6: The normalized HO count versus SBS density under the soft mobility model, the DC scheme, and the LTE system. *User velocity = 3 km/h, 15 km/h, and 30 km/h.*

FIGURE 7: Effect of different TTT/offset parameters on the HOF probability (user velocity = 3 km/h and SBS density = 1280 count/km²).

FIGURE 8: The average UE throughput under different SBS density (user velocity = 3 km/h and SBS density = 1280 count/km²).

and holds for a certain time TTT. The target slave SBS is selected from the SBSs which are under the same anchor SBS's control as the serving slave SBS

- (ii) Second, the serving slave SBS sends an uplink grant (UL grant) to the UE periodically in order to obtain the measurement report. Then, the UE sends the measurement report to serving slave SBS and anchor SBS to inform the anchor SBS that SBS-level handover is needed

- (iii) Third, the anchor SBS sends the handover request to the target slave SBS, and the handover request acknowledge character (ACK) is sent by target slave SBS to the anchor SBS. Then, the anchor SBS sends a handover command to both target slave SBS and UE in order to prepare and execute the handover

- (iv) Finally, handover execution is carried out, and the UE is synchronized with the target slave SBS. After

FIGURE 9: The average UE spectrum efficiency (user velocity = 3 km/h and SBS density = 1280 count/km²).

FIGURE 10: The normalized HOF count versus SBS density under the soft mobility model, the DC scheme, and the LTE system.

that, the anchor SBS informs the serving slave SBS to release the resource

It is important to note that compared with the handover procedure in the current system, the main differences of the SBS-level mobility management of soft mobility can be summarized as follows:

- (i) The SSBs are shared by SBSs within the same cell, while CSI-RS patterns are used for downlink measurement and target SBS selection
- (ii) The UE makes the HO decision, which achieves better flexibility than the current system by selecting the optimal SBS based on the user-centric decision

- (iii) The RSRP from SBSs, the load condition of SBSs, and the context information of UE can be taken into consideration of HO decision under the UE-controlled mobility

6.2. Cell-Level Mobility Procedure. When a UE moves to the edge of the cell, and the signal from SBSs in the current cell is unable to satisfy the A3 entering condition, the cell-level mobility from the current cell to another will be executed. The anchor SBS will trigger the downlink measurement, and UE will search for a new cell with a new SBS for providing high-quality continuous service. The main procedure of the cell-level mobility procedure is described as follows:

- (i) First, the RSRP of the neighboring SBSs are obtained periodically by UE, and UE makes the handover decision when condition (1) is satisfied and holds for a certain time TTT
- (ii) Second, the serving slave SBS sends an UL grant to the UE periodically in order to obtain the measurement report. Then, the UE sends the measurement report to serving slave SBS and original anchor SBS to inform the anchor SBS that cell-level handover is needed
- (iii) Third, the anchor SBS sends the handover request to the target slave SBS and the target anchor SBS; then, the handover request ACK is sent by target slave SBS to the original anchor SBS and target anchor SBS. Then, the original anchor SBS sends a handover command to both target slave SBS and target anchor SBS, and the target anchor SBS sends a handover command to the UE
- (iv) Finally, handover execution is carried out, and the UE is synchronized with the target slave SBS and target anchor SBS. After that, the target anchor SBS informs the serving slave SBS and original anchor SBS to release the resource

And the main differences between SBS-level and cell-level mobility procedures can be concluded as follows:

- (i) Cell-level mobility will be executed between SBSs when slave SBSs in the current cell are unable to provide high-quality service, and slave SBSs in the adjacent cell may be more appropriate to provide data service instead
- (ii) For cell-level mobility, other than the SBS-level measurement based on CSI-RS, an extra layer of measurement which is the cell-level measurement based on SSB should be triggered by the connection to edge SBSs
- (iii) The context of the UE is stored in the anchor SBS, and additional mobility procedures, e.g., path switch, are executed among the core network, the serving anchor SBS, and the target anchor SBS
- (iv) In the cell-level mobility scenario, not only the U-plane packet transmission path but also the C-plane RRC connection is reconfigured
- (v) The target SBS sends the *HO command* to the UE instead of the serving SBS for a better radio link

7. Performance Evaluation

The simulation parameters are configured according to the 3GPP [18, 19], as shown in Table 1. It is assumed that the initial position of SBSs and UEs obeys the Poisson point process (PPP), and the Random Waypoint (RWP) model proposed in [20] is adopted to simulate user's random motions.

FIGURE 11: Effect of UE velocity on HOF rate comparison between the proposed scheme and conventional scheme.

The normalized HO count for SBS density is shown in Figure 6. Since path switching is not required for SBS-level mobility in the soft mobility model, the HO delay and signal overheads are reduced. Because of an extra connection, the DC scheme consequently results in a more HO number. Compared with the number of HO in the LTE system, the number of cell-level mobility achieves a decrease of about 50%.

Figure 7 describes the effect of different TTT/offset parameters on the HOF probability where HOF probability = the number of HOF events/the total number of HO attempts.

Using Shannon capacity theory, the average user throughput and the spectrum efficiency (SE) are given by (4) and (5), shown in Figures 8 and 9, respectively. The SE decreases with the SBS density as the utilized resource blocks increase with the shorter UE-to-SBS distance. The average throughput and average user SE in the soft mobility model are better than those in the LTE system and the DC scheme. This is because, in the soft mobility model, the wasted resources of the SBS brought by the extra connection in the DC scheme are utilized.

Figure 10 compares the normalized HOF number in the soft mobility model with that in the LTE system and DC scheme. The HOF number for DC is detected and counted during the HO process of any of the two serving SBSs. It is shown that the soft mobility model reduces the normalized HOF count; thanks to the design for transparent handover. Specifically, we can see a significant improvement in the HOF number of soft mobility with a maximum decrease of more than 50% over the LTE system and a decrease of 45% over the DC scheme.

Figure 11 compares the HOF rate between the proposed scheme and the conventional scheme as a function of UE

velocity. It is shown in Figure 11 that the HOF rate linearly increases with the UE density, approximately. This can be explained by that the HO rate linearly increases with UE velocity, thus the HOF rate increase with the HO rate correspondingly. What is more, the simulation results showed that the HOF rate under our proposed scheme keeps decreasing by about 50% at different UE velocity compared with the LTE system.

Setting lower TTT and lower offset can decrease HOF probability; however, it will introduce high PP rate on the other hand. To trade off the HOF probability and PP rate, offset = 1 dB and TTT = 320 ms are the preference parameter configurations in the soft mobility model. Based on above figures, although the HOF probability under the DC scheme almost performs the same as that of soft mobility, it has a larger HO number.

8. Conclusion

This paper proposes and evaluates the soft mobility model as a solution to tackle mobility challenges in future dense networks. Soft mobility is aimed at minimizing the number of HOFs by achieving transparent mobility. The UCN is introduced to eliminate the cell edges where multiple SBSs in UE's vicinity serve the UE in the form of a single cell. Further, feasible mobility procedures are provided, where UE makes the decision and target SBS sends the HO command message instead of serving SBS. Simulation results showed that the soft mobility scheme gives better performance on HOF reduction than the LTE system.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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