



Intelligent 5-G handover in heterogeneous network

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Abstract

Our Research “Intelligent 5-G handover in heterogeneous network” is a Portability the board is fundamental in versatile correspondence organizations to give a smooth association during clients' portability. The Handover control boundaries (HCPs), like handover edge (HOM) and time-to-set off (TTT), are major and fundamental elements in versatility the executives that should be [characterize] cautiously to make productive handover ([HO]) methodology. The case turns out to be more delicate with the high portability speed situations. This study proposes different HCP framework settings to be explored and broke down over B5-G organizations. They will be researched with different versatile speed situations to outline their effect on the organization execution. The approve framework execution, for example, reference signal got power (RSRP), HO likelihood (Bounce), HO ping-pong (HOPP), radio connection disappointment (RLF), HO interference time (HIT), and HO disappointment (HOF). Results show that the different framework settings give unique and huge effects on the presentation of B5-G organizations. The setting of HCP1 acquired the best execution in RSRP and RLF with - 69.7 dBm and 4.8%, separately, while the ideal presentation of HOPP, HIT, Bounce, and HOF is accomplished in the HCP6 setting with 0%, 0.03 ms, 0.06%, and 0.3341%, individually. The general result of all HCP settings is 54.934%. These outcomes demonstrate a tradeoff among RLF and HOPP with different HCP settings in B5-G portable organizations. The HCP framework settings should be changed cautiously considering different variables, for example, versatile climate and use case. The outcomes show that the HO execution affected fundamentally by the different HCP settings has been explored. The [HOPP] likelihood is profoundly impacted by TTT more than HOM. The using a high framework setting for [TTT] and HOM, for example, 4800 ms and 8 dB, prompts a huge decrease in HOPP likelihood to roughly 0.0001%. In any case, the RLF is decisively expanded as TTT and HOM are expanded because of the late HO choice. Choosing the ideal HCP settings is fundamental to give ideal HO choices.

Key: Intelligent, 5-G, handover, heterogeneous, network, HIT, HOPP,TTT, HOM, HCP, RLF.

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Introduction

The gigantic increment of portable associated clients, versatile applications, different sorts of associated gadgets, and different administrations enormously increments portable information traffic development. Thus, the fifth-age (5-G) of the versatile

correspondence organizations and then some (B5-G) have created to satisfy this extraordinary need of portable information traffic development later on.

This new versatile innovation is promising to furnish different portable correspondence administrations with a high information rate, more extensive data transmission, high traffic



limit, more extensive inclusion, and low inertness [1][6][8]. Albeit this new innovation will get a few benefits numerous regions, issues in regards to versatility the board are as yet a major test that should be settled later on B5-G portable organizations. The exceptional issues incorporate the difficulties connected with versatility directing, handover (HO) choices, HO verification, handover control boundaries (HCPs) settings, and more other portability issues [2, 3].[6,8]

[5] Handover (HO) is one of the principal methods in portable correspondence networks that empower the versatile client gear (UE) to associate with the serving networks during its portability. The cycle is performed by changing its association from one base station (BS) to one more during its versatility without break in the ideal case [4] [7].

Background

[3][6][8] The 5-G and B5-G portable framework is the most recent term utilized for an upgraded versatile correspondence network that offers a few administrations, improvements, new applications, and omnipresent availability. [6][8] B5-G gives a fundamentally better presentation level than the past versatile ages as far as information rate, network limit, framework dormancy, network, and adaptability. 5-G is intended to give another sort of availability and applications, for example, car correspondences, huge video download, and controller with haptic style criticism, which required universal network. 5-G has likewise been created to give an extremely low

information rate to fulfill the prerequisites of a few applications, like sensors and Web of Things (IoT) applications. [5][6][7] All in all, 5-G empowers an expansive scope of uses, from those that require a low information rate to applications that need an exceptionally high information rate with low dormancy. In any case, one of the critical issues in B5-G networks that ought to be concentrated cautiously is portability the board. [2][3][4] This matter is a fundamental issue that should be settled to guarantee a consistent/smooth association for UE with the serving network while moving inside the organization inclusion region [2][7].

Mobility Management in B5-G

[6][8] One of the fundamental elements of cell networks is versatility the board. Figure 1 shows the distinguishing proof and following of changes in client area for client availability to cell network administration. The entrance portability capability (AMF), N2 is liable for the versatility the board undertakings and association, and Xn is for overseeing HO between B5-G cutting edge hub BS/base stations (gNBs). [4][5][6] This particular component gives network availability to clients at any area, and clients can profit of this capability to get to the organization at another area easily. So, versatility the executives gives clients a continuous and dependable association, correspondence, and administration [4] [7]. In a B5-G framework, the significance of versatility the board is fundamentally expanded as numerous applications are very availability delicate to the organizations [6] [7].

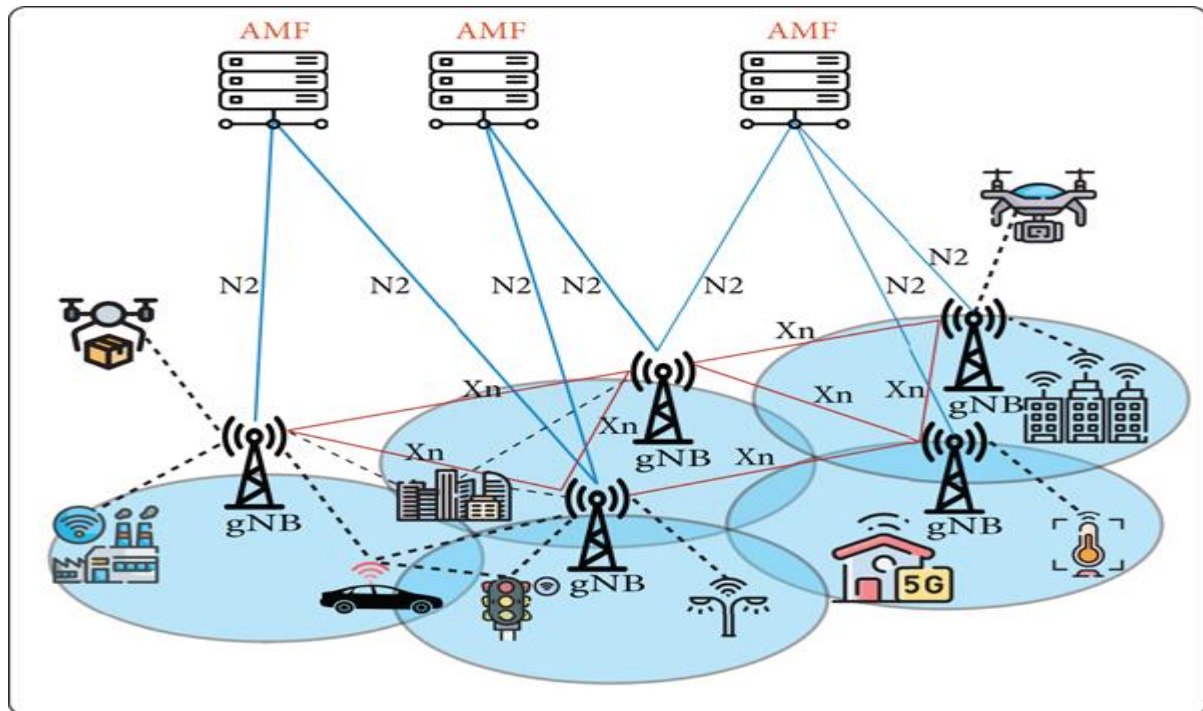


Figure 1: B5-G technologies.

[4][8] The UEs can execute continuous HO with the assistance of B5-G. Furthermore, B5-G offers different helpful elements, including conveying a high information rate, dealing with a more prominent volume of information, growing B5-G gadgets' market, lower dormancy, better nature of involvement for end-clients, and more energy preservation. [7][8] B5-G utilizes the ultra-thick organization (UDN) method that assists with satisfying the information traffic prerequisites of clients with its component of more prominent organization data transmission.

Management in B5-G

Portability the executive's arrangements intended for planned remote organizations might confront various issues [3, 6] [7,9]. These issues incorporate those related with higher thickness (in view of the huge assortment of client passageways). Different issues are related with heterogeneity (in view of similarity with assorted sorts of radio access advances (Rodents)) and issues with the programmability of the organization or climate. [6][7] This large number of issues require the plan of powerful versatility the board methods to give improved portability

the executives to clients for guaranteeing their availability and administration congruity in unique remote organization conditions [7].

[4][6] B5-G portability the executives ought to give fast to UE, for example, expressway speed (over 80 km/h) and high velocity rail (up to 500 km/h). Like any innovation, the high versatility of remote correspondence terminals has its own arrangement of advantages and disadvantages. The planning, demonstrating, and appraisal of future correspondence frameworks are altogether impacted by high versatility. What's more, engineers can utilize the elements presented by high portability to foster a superior framework configuration prompting further developed framework execution. From another angle, different disadvantages related with the plan of high portability correspondence frameworks incorporate the accompanying [9][4][7][8] : (i)Fast fading(ii)Channel assessment errors(iii)Doppler diversity(iv)High entrance loss(v)More incessant and fast HO.

Simulation Setup

The reenactment climate has been created in MATLAB R2020b to test the viability of HCPs in the HO execution for the B5-G organization.



The recreation boundaries are changed by 3GPP Delivery 16 [4.5]. The UEs are set to move straight however arbitrarily in the green limited circle with eight headings (45°) inside the recreation climate. They should go through BSs with six distinct situation speeds, 20, 40, 80, 120, 160, and 200 km/h. When a UE arrives at the edge of the green region, it haphazardly adjusts its development course. [7][9]Likewise, unique framework settings of researched HOM and TTT. [4][6]The setting values for TTT and HOM are chosen as low, medium, and undeniable levels. Figure 3 represents the flowchart of the overall recreation model with the HO choice calculation. RSRPs, RSRPt, and address the RSRP from a gNB source, RSRP from a gNB target, and recreation time, individually [6][8].

RSRP

[2][4][5] RSRP shows the power level (or just strength of signs) got in cell organizations, including B5-G and LTE. The typical sign strength or normal RSRP shows the power level or strength related with a specific reference signal [6]. RSRP is assessed in LTE networks by acquiring a normal of the general strength of all asset components that communicate the phone explicit reference signals. From another perspective, RSRP for B5-G organizations (otherwise called auxiliary synchronization SS-RSRP) is determined in light of optional synchronization signals. [4][5][6] These synchronization signals, which are well defined for every phone, are sent utilizing the source components [2] [3][4].The meaning of the measurement of RSRP in LTE and B5-G networks can't be denied in light of the fact that it is utilized widely during cell determination, HO, power control, and cell reselection methodology [6][8].

RLF

[3][6][8] A RLF is recognized when the retrogressive HO motioning with the source cell can't work as expected. In such a condition, the disappointment suggests that notwithstanding good radio circumstances for deciphering estimation reports got from the UE by the source gNB and the resulting transmissions to the objective cell for the execution of HO, the UEs can't translate the HO order got from the source gNB. [7] At the

point when a RLF is distinguished during a HO, the UEs execute a recuperation strategy. In this cycle, the RLF clock is turned on when UE distinguishes the radio connection issues. The RLF clock is normally set at 500 or 1000 ms [9].

[1][5][7] The specialist organization changes the RLF clock in light of drive tests inside the organization. When the RLF time lapses, UE sends an association solicitation to one more objective cell without disengaging from the current cell. UE figures out how to interface with the objective cell assuming that the source gNB has proactively coordinated the objective cell on receipt of the estimation report from the UE. [5][7][9] This interaction is additional tedious than the retrogressive HO methodology prompting delayed help interference. Be that as it may, this methodology forestalls the deficiency of briefly put away information inside the source gNB as a result of the highlights of information sending and all together conveyance.

Results and Discussions

The consequences of the decent HCP examination are introduced. Different fixed HCPs have been examined to explore the viability of the HO execution in the B5-G framework. A few HO execution measurements have been thought of, for example, RSRP, HOPP, RLF, HIT, HO rate, and HOF over various speed situations. This study has researched the adequacy of HCPs on HO execution in the 5-G portable organizations by proposing different HCP framework settings. The outcomes are assessed using different HO KPIs, like RSRP, Bounce, HOPP, RLF, HOPF, and HIT. The outcomes show that the HO execution influenced altogether by the different HCP settings has been researched. For instance, the HOPP likelihood is profoundly impacted by TTT more than HOM. Besides, using a high framework setting for TTT and HOM, for example, 4800 ms and |8 dB|, prompts a huge decrease in HOPP likelihood to roughly 0.001%. Nonetheless, the RLF is emphatically expanded as TTT and

HOM are expanded because of the late HO choice. Choosing the ideal HCP settings is fundamental to give ideal HO choices.

Jump is one of the HO execution measurements that assess a client's likelihood to HO, or at least, a radio correspondence interface from serving gNB to focusing on gNB. HCP1 accomplishes the more terrible Bounce with around 90% at a versatile speed of 200 km/h, while HCP6 gets the best Jump with roughly 0.05% for every single portable speed.

This outcome can be made sense of because of HCP1 and HCP6 being set by little and high upsides of TTT 4800 ms and TTT 60 ms, separately. HCP2 positions as the second-most noteworthy Bounce with a normal of 30%. Other HCPs (HCP3, HCP4, and HCP5) accomplish roughly comparable Jump beneath 10% in light of a comparative setting of TTT values and a slight change in HOM. Besides, the portable paces marginally affect the Bounce for all HCPs.

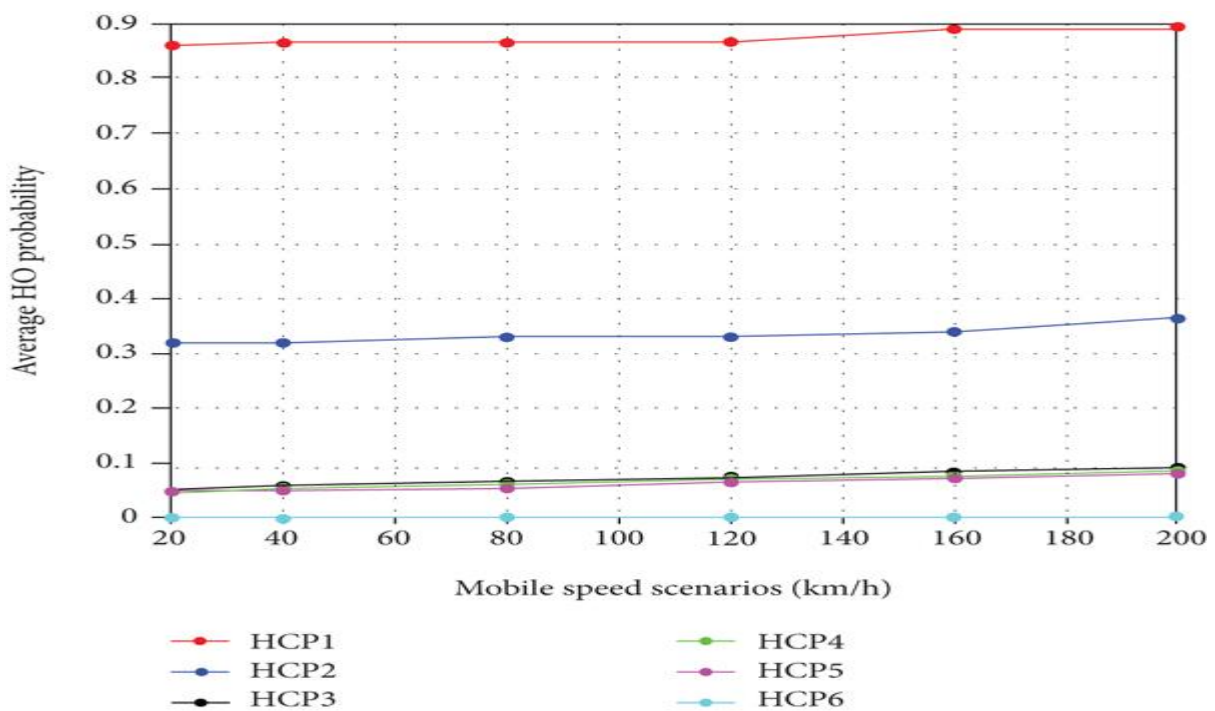


Figure 2: The HO probability at different mobile speeds.

[3][5][7] In outline, Jump increments as the quantity of cells endlessly increments with high versatility speeds. Besides, expanding the Jump builds the HOF, which diminishes the general framework execution. Besides, B5-G networks that utilization mm Wave and little cell arrangement face the test of expanding Jump. [5][6][7][8] Huge upsides of HCPs might decrease the quantity of HOs yet all the while increment the RLF. In this way, high level and wise HO calculations are extraordinarily required with B5-G frameworks to streamline the HCPs impeccably and address the

difficulties of portability the executives, which is essentially expanded with the utilization of mmWave [7][9][8]. **Conclusion**
 Besides, complex HO calculations that can give exact HO execution are fundamental for versatile remote organizations, especially in B5-G portable organizations with one of a kind applications, for example, high information rate, low dormancy, and wide transfer speed, contrasted and the heritage organizations. The future versatile organizations will utilize extremely high-recurrence groups (like mmWave, Terahertz, and noticeable light),



which give an exceptionally short inclusion cell region (i.e., up to 200 m with 28 GHz). Along these lines, Jump and HOPP will increment further. Moreover, to accomplish a consistent and quick HO, the HCPs should be set suitably.

The examination study adds to the comprehension of HCP viability on the HO execution in 5-G portable organizations and then some. That additionally assists with planning effective HO calculations. This work will be stretched out in our future exploration concentrate by considering further suppositions, framework settings situations, more KPIs, B5-G new use case, and higher portable rates in our next period of study work.

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