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A NOVEL ALGORITHM FOR IMPROVE HANDOVER DECISION IN HETEROGENEOUS WIRELESS NETWORKS

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ABSTRACT

Sending a huge amount of information among various network position through the network links based on the networks traffic capability and data rate. Usually, a mobile device may be mobility to realize the processes of vertical handover. The utilize of a single standard may reason service intermission, an unstable network pregnancy and an inactive vertical handover. In this paper, it proposed a novel algorithm to improve vertical handover decision based on use decision trees to classify handover and effectiveness, correction rate among them. The algorithm consists of two technology interfaces: Worldwide interoperability for Microwave Access (WiMAX) and Long-Term Evolution (LTE).It also proposed a new mechanisms based on different prioritizations to support handover decision. The simulation results show which the three kinds of decision systems better than the traditional network decision system whence handover number probability and the handover failure probability. Furthermore, it is observed which the network priority handover decision system makes better findings compared to the equal priority and the mobile priority handover decision system. Lastly, the simulation findings are validated over the investigative model.

Keywords: network decision system, long-term evolution, mobile priority.

1. INTRODUCTION

With the growing requisite to wireless applications and number of wireless mechanisms, suppling the greatest linking to positions of the mobile is a significant scheme to the inventers, particularly when the mobile is a wandering [1]. So to resolution which several scholars have influenced in various ways to determination the connected cases for exampledinamong various mechanisms, handover and scheduling proceedings. These issues are replied for preliminary from the handover, interference for plan. Few years have passed the dramatic optimization of the wireless networks is inauguration a pathon the way to the amalgamation of each IP-by the networks, that helps to method the Next Generation Networks (NGN). It refers for the growing request of these consort in the life so user's requests are also improved and service workers are competing to supply various services for fill their clients to an improved level of service. However, client's requests cannot be encountered through a single worker particularly but the user is wandering. The heterogeneous wireless networks are very interesting specially through wandering of the clients over a number of the available network. The networks have various ability such as obtainable bandwidth. The client handoffs among various networks to content its QoS requests though the client is wandering. This process is typically knowledgeable as a vertical handover (VHO) because of the handover between various kind of wireless networks to reach improved QoS and quality of skill for the end client [2-3].

The handoff research route between network peers have shifted through the former years, in order to growing data rates and improved communication involvements has been create changed the first three contribute that achieve it. While, the 4G network mechanisms goal at suppling prolongedmoveadvantages with enhanced and greater information rates and services.

The developing in handover decision is very important especially in handover techniques. A vertical handover decision is based on several condition which connected with the wireless networks while station which based on mobile is at current related and the base station will realize a handoff in the henceforth. In this paper, it proposed new algorithm that based on multiple mechanism with different prioritizations to improve handover decision. In this mechanism, it is depending on RSS and multiple attribute for calculating each part in the network. In addition, the prioritizations mechanism that based on available bandwidth, remaining time, RSS and multiple attribute. The algorithm achieve better results compared with others mechanisms.

2. FEATURES OF HANDOVER AND HANDOVER DECISION METRICS

There are many handover methods that are characterized by a different approach, that able to be easy, difficult or unified. Fornewdirections, a huge of scientists have operated on providing a unified handover to incessant service constancy. The significant characteristics of everywhere is to enable mobile clients to provide them approximately to connect with the contact applications utilizing various intelligent and collaborating tools such as mobile phones and digital TV groups. However, switching over various contact networks is not as impleresponsibility and it requires an appropriate technology for helpful client and application requirements based on Quality of Services (QoS).

Several standards have been utilized for create the handoff decision application. For save clientscontinuouslygreatestlinked, different QoS parameters are considered which impact the VHO

decision. Because of this issue, it proposed some QoS parameters:

2.1 Received signal strength (RSS)

It is a conventional and inevitable issue to creation handover decisions. It gives information around the power level being collected through the transferring midair. It reductions when a client energy absents from the checking base station. The handover process facilitates the mobile users to move from one network to another [4-6].

2.2 Cost of monetary service

Each network supply conformed services to its client, that are typically fraught at cost. Typically, the higher cost to improved QoS, nevertheless if it has two mechanisms suggestion the similar grade of QoS, the lowermost network cost will have become preferred [7-9].

2.3 Latency of handover

Usually Layer-2 proceedings happen to encourage anovellinking with the novel network and this process might receipt greater latency. It is likewise cavity on to as delay of handoff. Real time services such as rendering of voice are normally recognized as latency subtle and this damages their general operative. Through handover, packages are typically stored via the network even the next wireless terminal is motivated to receipts them. This latency increases for higher layers and reasons unexpected rises in package latencies [10-11].

2.4 Control of security

It is one of the key proceedings which ascends when networks gathered are connected. Each network has its own options of protection and security and the user needs to respond to the handoff process. These requirements are to harmonize the various security rules used by wireless networks and that have different security layers and different features. The handoff procedure needs enhanced security and particularity via espionage, recording takeover, offensives [12-13].

2.5 Throughput

It mentions for the information rate supplied to the mobile terminals in a network. Mobile terminalsusuallyfavoranapplicant network which suggestions greater throughput to their synchronized applications [14].

2.6 Bit error rate (BER)

It is the number ratio of receipt bits which have been reduced because of din and interference such as herm a noise for the complete transporting bits' number through a change interval of time [15].

2.7 Signal to noise ratio (SNR)

The ratio of the examination of control SNR for reception at each station has been widely used to choose the appropriate codec [16].

3. RELATED WORK

Several methods have been suggested to vertical handover process according to a number of standards, for example available bandwidth, RSS, SINR, cost of linking, latency of handover, mobile terminal'sspeed, consumption of battery and QoS. In this algorithm, the mobile checks each node and base stations in the network by attribute values and at that moment handover to the one that able to suggestion the lowermost delay and the highest bandwidth. It is easy to perceive which it is not imaginable to sendanappropriatedecision only over assessing these standards such as latency and bandwidth principals forarise in the false handover estimate ratio. While [17] the handover method proposals with fewer complex system though keeping a decision robust vertical hand off among wireless networks. However, the technique is depending on a valuation of the standards of the several recovered the close base stations and specific the possibility receiver base station.

On the other hand, in [18] suggests a novel description of the easier vertical handoff together with a system for wireless schemes to support the discussion. In this technology describes how to calculate network reception cases for user mobility depending on the available bandwidth and application kind. The suggested description is mostly absorbed for the greatest work service into the UMTS networks utilizing various move situations. Evaluate the performance of the framework that offered by the authors based on the handover decision by bandwidth among WLAN and WCDMA.

Where handoff is activated for network which exhibitions greater SINR values. Typically, the SINR provides high productivity for users larger than the RSS where the SINR provide all the needs at the same time in productivity during the SINR. Though, it able to belikewiseoutcome in extreme handovers as an outcome of the difference of the SINR and it reasons the Ping-Pong impact. On the other hand, authors in [19] have likewise offered a SINR-based method through seeing the obtainable data rate and back haul bandwidth for scheming the handover decision time and improving the resource distribution in the available network. Nevertheless, some delay is persuaded in their suggested system due to indecorous network choice.

In [20] the authors suggest a new handover method to decrease of handoff failure probability and the exclusion of needless handoffs. In this method used three different mechanisms and were linked to one another: - (1) this method determine the requirements of upward and downward vertical handovers process. (2) Adaptive thresholds are used for each network to determine the difference between each mobile station which acts on the velocity and also assess the response time. (3) A Dwell Timer for rapid mobility stations; it is helpful at high speeds a mobile terminal situation where the mobile station recognizes if it should handoff directly or stay linked to the present base station depend on the concealment region of anexact network. This timer assistance in prompt handover and decreases the waiting time This procedure decreases handoff failure and Ping-

Pong impact, nonetheless an extra value of gesturing is also monitored that creates package loss.

[21] proposes a handover technology so as to investigate high the handover estimate competence utilizing the RSSI with hysteresis. They have definite the two various thresholds for achievement the better utilize of it. This system includes dimension of the average rate of pre-determined thresholds to the handoff instigation. For this issue, anenoughsamples number are prepared as an assistance in RSSI the number of handoff approximation, that is most probable to occur among the real and receiver base stations.

This assistance in the estimate of handoff likelihoods between contributing base stations, likewise deliberated the influence of variations in RSSI on the capability of forecasting the capability. The suggested system does not requirement to create a border entry of mobile clients or each set knowledge of the receiver networks. Nonetheless, the writer's requisite to deliberate the question of the disruption of handoff in the conditions of mobility estimate of vertical handoffs.

On the other hand, in [22] used the IEEE 802.21 standard as a layout for applying the system. The operation of handover system evades unnecessary vertical handoff from WiMAX to WLAN in models with different traffic kinds and speeds of the mobile nodes. The outcomes illustration which the suggested system optimizes the vertical handover delay, packet loss and average throughput of the mobile clients.

Furthermore, [23] suggests the Vertical handoff decision systems are compared and Method of order favorite over like to ideal key (TOPSIS) in an allocated manner. TOPSIS is utilized to select the greatest network from the obtainable Visitor networks (VTs) for the incessant linking over the mobile station. This work, it mainly focused to the handover decision stage and to decrease the dispensation latency in the time of handoff.

In [24] proposed a handover decision system which uses generic structure and chooses the network for handover every which the quality of knowledge of the client is near best. The simulations show which system decreases needless handovers and likewise satisfies the handover requests.

In addition, it compared the systems depend on the network collection techniques, elasticity and difficulty of the mechanisms utilized. It finds which the distribution of cross layer design as a handover activate and then achieves handover accordingly with multi-path transition able to decrease package loss about the handover [25]. On the other hand, it suggested an enhanced vertical handoff decision utilized multi standards metrics in the setting of wireless network depend on three network interfaces: (i) wireless local area network (WLAN), (ii) wideband code division multiple contact (WCDMA), and (iii) worldwide interoperability for microwave access (WiMAX). In the vertical handoff decision, four metrics are considered: (i) RSS, (ii) mobile speed, (iii) traffic class, and (iv) network occupancy [26].

Moreover, an effective interference management mechanism is required to optimize the system performance. One of the allowing mechanisms for Long Term Evolution (LTE) distributions is the femtocell mechanism. Through having femtocells organized indoors and closer to the client, high data rate services able to be supply capably. Therefore, the decision to activate a handover is a crucial ingredient in the design procedure of handover, then the achievement and the effectiveness, to a large size, based on the precision and suitability of the decision. The design of an effective and successful handover needs a careful choice of parameters and the optimal framework. The LTE criteria upholding two parameters to excite the handover and choice the receiver cell: hysteresis margin and Time-to-Trigger (TTT). Mini microcell base stations likewise mentioned to as femtocells optimize the quality of service of indoor and outdoor clients. Mobility management remains a significant case with respects to their distribution [27]. In [28] is offered method under different network situations the metrics and depend on various types of applications such as text messages, audio and video. It is essentially concentrated on performance metrics like average throughput, packet delivery ratio, energy consumption, handover delay and authentication delay. The evaluation is complete between various types of application utilized to communication. Furthermore, in [29] offered a networks choice system in fourth generation heterogeneous network. Radio network choice is the technology that creates a decision how to choice the most appropriate RAT based at the found contacts, QoS limits, worker policies, consumer selections and available scheme capability and utilize.

4. MATERIALS AND METHODS

4.1 Simulation tools

In this paper, the simulation was used NS-2 in order to improve vertical handover over WiMAX and LTE.

4.2 Proposed system

4.2.1 Handover decision algorithm

It obtains the CNS over the choices prepared through the decision tree. Formerly, the proposed method creates multiple feature decision values for every network in CNS. It is also choosing the values that based on the maximum multiple feature like the receiver network to contact by decision tree. It is based on this equation: -

$$H_i(x) = \frac{(RSS_i(x) - \varepsilon_i)}{\varepsilon_i} * (1 - P_i(FAP)(x)) * (1 - P_i(MAP)(x)) * (1 - BER_i(x)) * (1 - P_{qi}(x))$$

Where ε_i is the RSS threshold of network i, $P_i(FAP)(x)$ is the FAP of network i, $P_i(MAP)(x)$ is the MAP of network i and $P_{qi}(x)$ is the obstructive rate of network i. Through the hand over implementation stage,

MT handover happens for the α network in agreement based on this situations: -

$$H_{\alpha}(x) = \max\{H_1(x), H_2(x),,,,, H_f(x)\}$$

The α network is the handover receiver network. If the method defeats to make the CNS, at that time it chooses the network with the maximum RSS as the receiver network. If the receiver network is of the similar kind as the present network, a horizontal handoff happens. Then, a vertical handover happens as well. If the receiver network is the network presently creation retrieved, the MT going to not handover.

4.2.2 Priority system based on bandwidth

The Bandwidth distribution system is categorized through bandwidth degeneration issues that are realize for every class BS traffic, respectively, the section of the bandwidth which has been already decadent of an accepted handover, the maximum fraction of the bandwidth of an admitted handover which able to still be decadent to receive a new handover. Since the bandwidth of real-time traffic classes cannot be degraded at all, the bandwidth degradation factor of all the real-time traffic classes equals zero.

$$Y_m = \frac{C_{m,r} - C_{m,a}}{C_{m,r}}$$

$$Y_{m,p} = \frac{C_{m,r} - C_{m,p}}{C_{m,r}}$$

Where $C_{m,r}$ denotes the bandwidth demanded through a call of the *m-th* class traffic. A call of *p-th* class (*p*=0 denotes the handover of each type of traffic) able to be established over the scheme only if the situation $C_{m,a} \geq C_{m,p}$ (for every the traffic classes of *m*=1… *M*) holds after a call of traffic class *p* is accepted.

$$1 > Y_{m,p} \geq Y_{m,1} \geq \ldots \geq Y_{m,m} \geq \ldots \geq Y_{m,M} \geq 0$$

The distribution amount of bandwidth from every of the current *m-th* class traffic calls to receive a handover of *p-th* priority traffic class is compute based on this equation.

$$C_{priority} = C_{m,r} - C_{m,p} = Y_{m,p} * C_{m,r}$$

The equations from3 to 6, it is clear which the scheme is more adaptive to receive higher priority handover requirements.

4.2.3 Priority based on remaining time

The proposed Priority depend on Multi-Queue package scheduling system, nodes at the lowest level, L_k predicted, and procedure and transfer information through their assigned time, while nodes at level $L_k - 1$ and upper levels accept information also to predicting, working and transferring information. It is seeing only two levels in the ready queue of network nodes which are placed at the lowest level then these nodes do not receive packages from each lower level nodes. It likewise estimates which every node needs time to predict of information packages and likewise procedure local and/or remote information packages. For example, $T_{(k)}$ performs the real-time information time at a node i. If the working time of real-time data at node i is less than $T_{(k)}$ then node i will have time remaining to procedure information packages. Correspondingly, if node i still has some remaining time, it able to procedure other information packages.

$$K < T_{1(k)}$$

Where k represents process timer each BS

$$K = \sum_{j=1}^{n_k\,(number\,of\,queue)} \Pr ocess\ Time\ (j)$$

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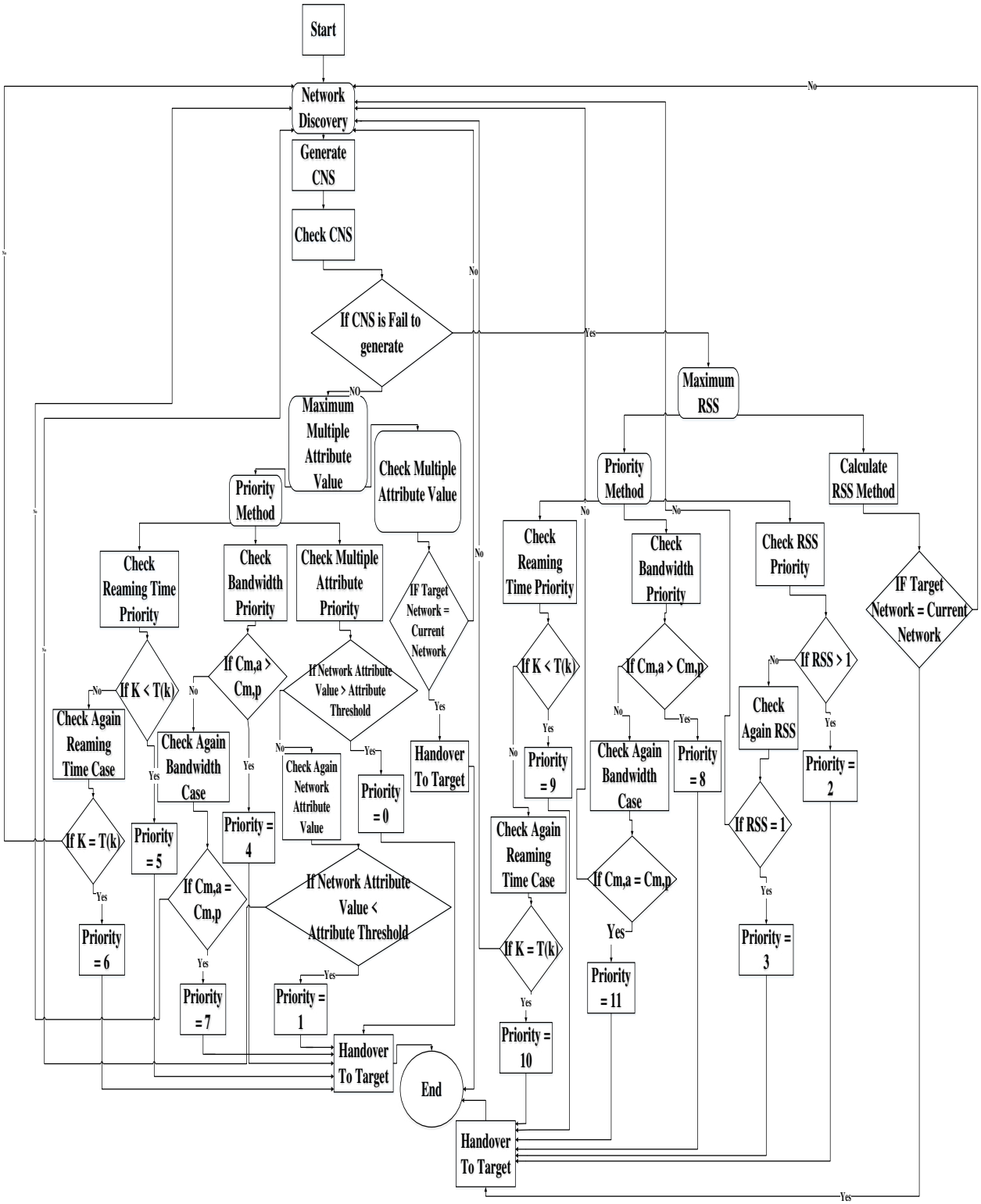

Figure-1. The proposed algorithm that based on decision tree with different prioritizations.

All queues tasks of BS in L_k are processed based on this equation

$$K < T_{(k)}$$

Let Total real time tasks for BS by this equation

$$L_k = n_k * (number\ of\ queue)$$

Remaining time after data arrival based on this equation

$$T_{(k)} = T_{(k)} - ArrivalTime_k(t)$$

4.2.4 Handover decision algorithm based on prioritizations

Figure-1 offers a novel algorithm with different prioritizations. The proposed system based on different priority for handover decision such as priority 0 represent high priority and priority 11 represent low priority for each mechanism. In addition, it utilized the weights to calculate the predictable effect of every standard on choosing the most suitable network for handover determinations. The new algorithm that based on multiple mechanisms makes handover decision better and more efficacy. Table-1 presents the multiple standards for different prioritizations.

Table-1. Multiple standards to set different prioritization.

Standards	Equal prioritization	Mobile prioritization	network prioritization
Multiple Attribute	0.3	0.1	0.4
RSS	0.3	0.2	0.5
Bandwidth	0.3	0.5	0.1
Reaming Time	0.3	0.5	0.1

5. RESULTS

It applied the traditional network based on the RSS scheme in vertical method. Essentially, almost each of the papers and real placements are concentrated on a single metric such as RSS since this data is gauged in each part in the network by this mechanism can early predicate for the suitable data before arrive the mobile. When this scheme is used for operation in the handover aspect because of the ease. Consequently, the simulators process offers this invention in order to evaluate handover decision methods as well as to study the efficiency of the system. Furthermore, handover efficiency is based on the success or failure of handover in the network. Multiple criteria are based on three priority types that also contain sub-priorities which have been proposed to make the handover decision more efficient. They are equal prioritization, mobile prioritization and network prioritization, and they are used in a wireless network environment. It has been investigated and compare each priority based on the proposed algorithm with the traditional method which is based on RSS standard. The multiple criteria that proposed in our algorithm depend on four types: - remaining time, bandwidth, RSS and multiple attribute values. Figure-2 illustrates the approach that depends on determining the equal prioritizations of the handover process during the proposed algorithm compared to the traditional method which contain on 200 mobile users. The proposed algorithm with the equal prioritization is achieved better performance by the handover number of the 25% in the network compared to with the traditional method. The proposed algorithm reduced the number of handover which improves network efficiency and raises available resources.

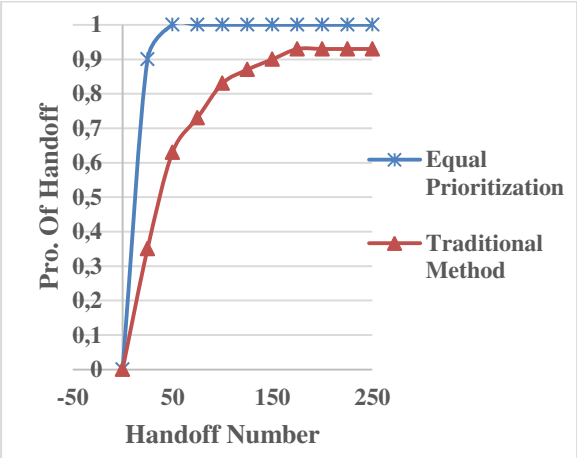

Figure-2. Handover number probability based on equal prioritization method.

The proposed algorithm with the mobile prioritization has achieved a better performance compared with the traditional method by 42% in Figure-3. The mobile prioritization has reduced the number of handover in the network, resulting in improved performance and better efficiency.

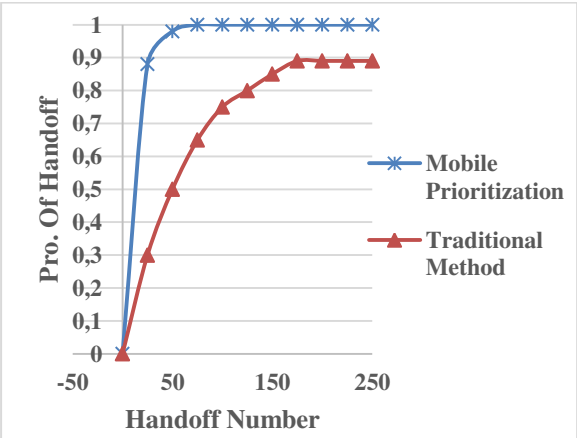

Figure-3. Handover number probability based on mobile prioritization method.

Figure-4 shows the algorithm proposed with network prioritization achieved a better 27% performance in the average handover. In the traditional method, the traffic load increases as it creates a larger volume in the delivery process. On the other hand, the proposed algorithm with mobile prioritization has given better performance than the equal prioritization as well as the prioritization of the network, because the weights of standards based on the huge ratio for remaining time, bandwidth, multiple SNR and maximum RSS.

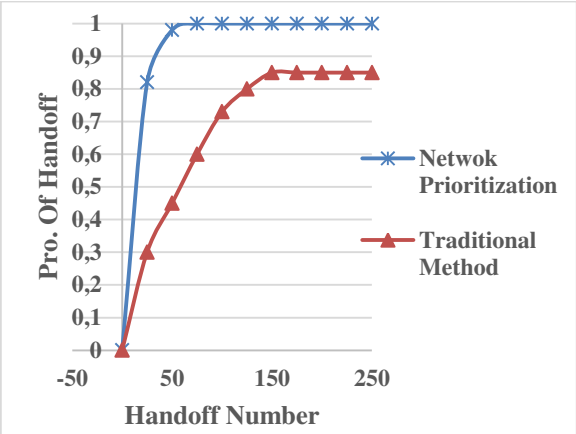

Figure-4. Handover number probability based on network prioritization method.

Figure-5 illustrates the proposed algorithm with the equal prioritization based on the average handover failure probability. The proposed algorithm has improved performance by 25% compared with the traditional method where the average handover failure probability in the traditional method is 0.25 while the proposed algorithm with the equal prioritization is 0.15.

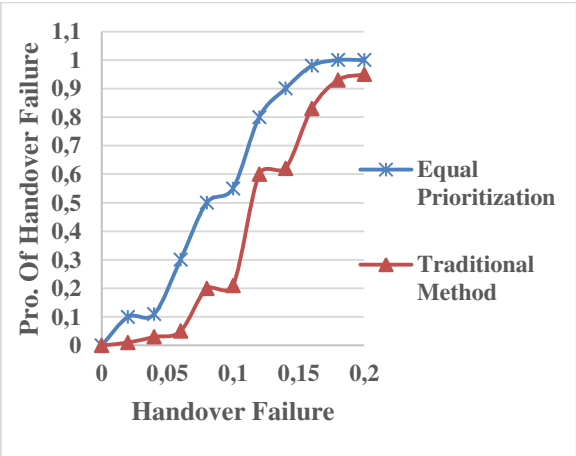

Figure 5. Average handover failure probability based on the equal prioritization method.

On the other hand, the Figure-6 shows the proposed algorithm with mobile prioritization which achieves a 40% improvement in performance compared to the traditional method. The proposed algorithm with mobile prioritization has an average handover failure probability of o.15 while the traditional method is 0.26.

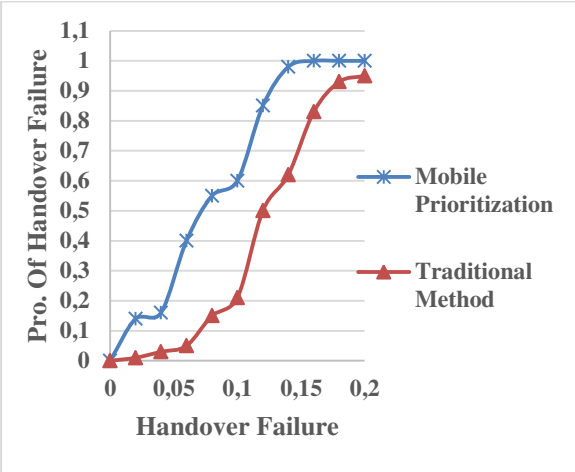

Figure-6. Average handover failure probability based on the mobile prioritization method.

Figure-7 shows the algorithm proposed with network prioritization performed better than the traditional method by 49%. In addition, the proposed algorithm with network prioritization achieved an average handover failure probability of 0.14 while the traditional method achieved of 0.29.

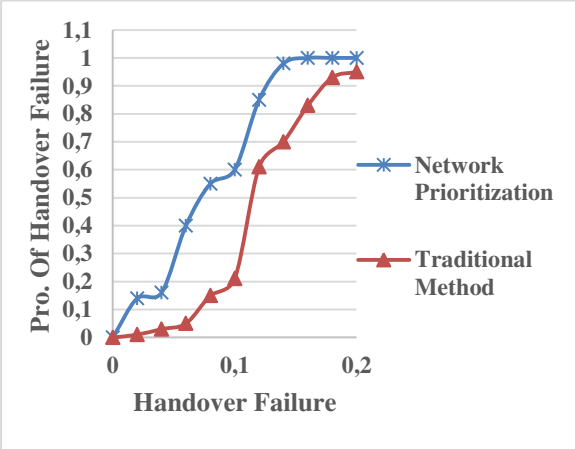

Figure-7. Average handover failure probability based on the network prioritization method.

6. CONCLUSIONS

In this paper, it proposed a new algorithm with different prioritization to overcome the problem of maximum handover in wireless networks and also to support the decision of handover. As well as by the proposed algorithm will allow mobile devices to establish a right handover decision. The simulation showed that the proposed algorithm achieved significantly improved performance with various metrics. On the other hand, the proposed prioritization method improved the handover decision significantly compared to the traditional method.

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