Retraction Notice

Title of retracted article:	**Handover Time Delay Reduction and Its Effects in Cloud Computing**
Author(s):	Qassim Bani Hani, Julius Dichter, Jamal Fathi
Journal:	Communications and Network (CN)
Year:	2014
Volume:	6
Number:	4
Pages (from - to):	243 - 256
DOI (to PDF):	10.4236/cn.2014.64026
Paper ID at SCIRP:	6101450
Article page:	http://www.scirp.org/Journal/PaperInformation.aspx?PaperID=51717
Retraction date:	2016-08-15

Retraction initiative (multiple responses allowed; mark with **X**):
☐ All authors
X Some of the authors: BANI HANI, QASSIM
☐ Editor with hints from
- ○ Journal owner (publisher)
- ○ Institution:
- ○ Reader:
- ○ Other:

Date initiative is launched: 2016-06-28

Retraction type (multiple responses allowed):
X Unreliable findings
- ○ Lab error
- **X** Inconsistent data
- ○ Analytical error
- ○ Biased interpretation
- ○ Other:

☐ Irreproducible results
☐ Failure to disclose a major competing interest likely to influence interpretations or recommendations
☐ Unethical research

☐ Fraud
- ○ Data fabrication
- ○ Fake publication
- ○ Other:

☐ Plagiarism
- ☐ Self plagiarism
- ☐ Overlap
- ☐ Redundant publication *

☐ Copyright infringement
- ☐ Other legal concern:

☐ Editorial reasons
- ○ Handling error
- ○ Unreliable review(s)
- ○ Decision error
- ○ Other:

☐ Other:

Results of publication (only one response allowed):
☐ are still valid.
X were found to be overall invalid.

Author's conduct (only one response allowed):
X honest error
☐ academic misconduct
☐ none (not applicable in this case – e.g. in case of editorial reasons)

* Also called duplicate or repetitive publication. Definition: "Publishing or attempting to publish substantially the same work more than once."

History
Expression of Concern:
☐ yes, date: yyyy-mm-dd
X no

Correction:
☐ yes, date: yyyy-mm-dd
X no

Comment:

The paper is withdrawn from "Communications and Network" due to personal reasons from one of the author of this paper.

This article has been retracted to straighten the academic record. In making this decision the Editorial Board follows COPE's Retraction Guidelines. Aim is to promote the circulation of scientific research by offering an ideal research publication platform with due consideration of internationally accepted standards on publication ethics. The Editorial Board would like to extend its sincere apologies for any inconvenience this retraction may have caused.

Editor guiding this retraction: Prof. Bharat Bhargava(EiC of CN)

Communications and Network, 2014, 6, 243-256
Published Online November 2014 in SciRes. http://www.scirp.org/journal/cn
http://dx.doi.org/10.4236/cn.2014.64026

Handover Time Delay Reduction and Its Effects in Cloud Computing

Qassim Bani Hani[1], Julius Dichter[1], Jamal Fathi[2]

[1]Department of Computer Science, University of Bridgeport, Bridgeport, USA
[2]Department of Electrical and Electronics Engineering, Near East University, Nicosia, Northern Cyprus
Email: qbanihan@my.bridgeport.edu, dichter@my.bridgeport.edu, jamalfathi2004@gmail.com

Received 4 October 2014; revised 30 October 2014; accepted 10 November 2014

Abstract

Mobile devices connected by cellular service require a constant connection to a base station. As these devices move from place to place, they need to disconnect from one base station and connect to another. The process of transferring between base stations found in neighboring geographic areas is referred to as the handover course of action. During the handover course of action, the connection to the disconnected cellular device and the serving basic base station terminates. The quality of cell WiFi networks will suffer considerably from any handover latency as well as the supply decline percentage. In our work, we propose and implement in MATLAB a simple handover program applying mobility behavior pertaining to WiMAX networks. The ability to produce mobility pattern table is implemented to help in determining another available basic base station and as a consequence eliminate needless verification. Additionally, the serving basic base station forwards important computer data packets which it received throughout the entire handover course of action for the targeted base station giving a reduction of the supply decline percentage. Extensive simulation studies are executed to judge the efficiency inside suggested program using MATLAB. The outcome proves that our program can with certainty reduce the handover latency as compared with other solutions found in the literature.

Keywords

WiMAX, Handover, Signal Strength, Packet Drop, Base Station

1. Introduction

Looking at the development that is along these few lines that joining the target BS as incidentally rather than a mobile station system separating each of the pushed base station. This may give a diminishing which yields that

How to cite this paper: Hani, Q.B., Dichter, J. and Fathi, J. (2014) Handover Time Delay Reduction and Its Effects in Cloud Computing. *Communications and Network*, **6**, 243-256. http://dx.doi.org/10.4236/cn.2014.64026

the compass not with remaining on an extraordinarily key level minimized extending and cooperation works out so that the critical deferral time in reacting to the base station. The aching with the neighboring base station ideal for a specific handover change is poverty stricken upon these key parameters:

1) Direction of the mobile station system movement.
2) Average time interval in between each hop of the mobile station.
3) Current load of a neighboring base station.
4) Position and coverage of the neighboring base station with regards to the current select base station.

Selecting the right base station for the scanning activity is usually a joint decision on the select base station according to its signal strength and the response time taken, as well as the concerned mobile station system while using select base station utilizing the most decision-making responsibilities belong to the base station in order not to get disconnected with the visitor mobile station even for a while. This importance in connection belongs to the fast in respond of the base station and its capacity.

By topic of performance and the interference which depends on the BSs separation distances, that proportional to the overlap region and the antenna used in each BS, for this none of the appropriated effects were broad enough to unmistakably evaluate precisely, which depends on the different stages that are going to be taken as the maximum offer of the aggregate handover time. Thusly basic exertion was obliged to this study, reproduce and break down the execution of the sorted out WiMAX handover. This proliferation was completed by MATLAB programming.

The rest of the paper is organized as follows: In the next Section 2 presents the related work. In Section 3, performance and interferences of the proposed model explanations. The proposed handover detailed design scheme is presented in Section 4. The simulation results and performance evaluation is described in Section 5. Section 6 concludes this paper and presents future work.

2. Related Work

Many researchers submitted several works in the subject of data security and in particular in the subject of steganography. The following are some of the current works in the field of the handover, where handover means exchanging a progressing call or information sessions one phone to trade. Handovers happen as a consequence of the change of the adaptable client starting with one achieve then onto the accompanying range. Handovers are utilized to keep a progressing call to be separated as Hyeyeon *et al.* [1] demonstrated several handover longing numbers to decrease the handover latency by fast handover impelling. Moreover, broke down multipath transmission control protocol (MPTCP's) essentialness usage and handover execution in distinctive operational modes. Finally found that (MPTCP) engages smooth handovers offering sensible execution really for extraordinarily asking for procurements, for instance, voice over internet protocol (VOIP). To the degree that, proposed a low-flightiness received signal strength indicator (RSSI)-based computation and, then, an improved mixture RSSI/extraordinary put version. Where, the proposed RSSI-based vertical handover (VHO) figuring guarantees a constraining extraordinary put increase at the mechanical tester sensor (MTS). Where, the estimations showed a possibly extensive change using universal mobile telecommunications system (UMTS) showing data with relationship to Global system for mobile communications (GSM) as to handover range precision.

Vasos *et al.* [2] softened down the idleness sections up Mobile Ipv6 handovers. What's more, gave genuine execution results for enormous parts of the handover handle through estimations in a veritable Mipv6 use on a remote proving ground centered on IEEE 802.11b. Khan [3] introduced a diagnostic work that improves the handover system. The creator talked about, gatekeeper channels, call induction and handover queuing focused around the covering scope ranges in the neighboring cells. Nishtith *et al.* [4] displayed diverse parts of handover to the extent that demonstrated handover usage, and the systems of handover and the assessment of handover and its execution. Wong *et al.* [5] explained quickly the high dangers of irregularity of tend to patients, and explored the vitality of clinical handover, to the extent that outlined the dissection accessible on distinguishing clinical handover process, gave a writing audit in regards to clinical handover and worldwide distributed meets expectations.

Pandey *et al.* [6] clarified issues inside handover handle, and proposed system to enhance handover time inactivity. Hsieh *et al.* [7] handled two imperative difficulties: 1) Enhancing handover execution in heterogeneous remote system, and 2) enhancing Transmission Control Protocol TCP execution in multi-jump remote system. In heterogeneous system, clients expect continuous administrations moving from a solitary system to another. In-

stitute of Electrical and Electronics Engineers (IEEE) proposed media independent handover (MIH) to bring about a noticeable improvement handover execution. Fu *et al.* [8] essayed that at present mobile IPv4 (MIP) will be the overwhelming instrument for versatility administration and should persevere into the future. Mortaza *et al.* [9] subsequently presented the neighboring cells may experience the ill effects of inordinate impedance that is produced by this MS. Besides, a hazard that connection quality declines all of a sudden change an extensive part, *i.e.* consequently, remove handover needs to be begun up. Chao *et al.* [10] explained the high dangers of irregularity of nurture patients quickly, and audited the essentialness of clinical handover, to the extent that abridged the dissection accessible on recognizing clinical handover process.

Purnendu *et al.* [11] clarified issues inside handover handle, and proposed system to enhance handover time inertness. Abduloulaziz *et al.* [12] displayed another vertical handover choice to minimize the amount of disappointment and unnecessary handover in remote systems, their proposed calculation relies on upon the estimation time and figuring of limit time. To extent that the handovers that happening between mobile station (MS) and the remote neighborhood wireless local area networks (WLANs), where this strategy vanished the disappointments and the unnecessary handover time by 70% to 80%. Akki *et al.* [13] explored the properties of Asynchronous Transfer Mode ATM and its profits, to the extent that clarified how it manages its characteristics, necessities, convention architectures and the worldwide exercises. Hu *et al.* [14] introduced a strategy for taking care of the directing issues by overlaying static sensible topology over the physical star grouping by producing close ideal most limited ways. Mushtaq *et al.* [15] distinguished the execution of the handover over worldwide interoperability for microwave access WiMAX-WiMAX, WiMAX-UMTS and WiMAX-Wifi regarding the chose measurements. To decrease the handover time idleness for portable Ipv6 (Mipv6).

An *et al.* [16] proposed an instrument with extra primitives and parameters to the media free handover administrations characterized in the IEEE 802.21 in order to decrease the handover time delay in the FMipv6. To comprehend the impacts of Duplicating Address Detection on the handover time delay. [17] Vasos *et al.* analyzed the well-known methodology of Mobile Ipv6 in the genuine remote proving ground, which is focused around IEEE 802.11b and extricated the taken information by system elements throughout the development of the versatile endorser. Shin *et al.* [18] created another system to diminish the Media Access Control (MAC) layer handover inertness on account of Voice over IP (VOIP) gets consistent. The proposed model which is called Spmipv6 might be restricted to one Round-Trip Time (RTT) between the versatile endorsers and the target access switch to diminishing the handover.

3. Performance and Interference

By topic of performance and the interference which depends on the Base Stations (BSs) separation distances, that proportional to the overlap region and the antenna used in each BS, for this none of the appropriated effects were broad enough to unmistakably evaluate precisely, which depends on the different stages that are going to be taken as the maximum offer of the aggregate handover time. Thusly basic exertion was obliged to this study, reproduce and break down the execution of the sorted out WiMAX handover. This proliferation was completed by MATLAB programming. It introduced the outline of an improved cross-layer based handover calculation, which comprehends the delayed handover handling acquired when utilizing portable WiMAX by wiping out the checking stage performed by versatile supporter stations. The calculation used the presently associated vehicles to gather MAC and PHY layer data about target base stations, and afterward show the data to briefly disengaged ones. The separated vehicles then alter their WiMAX connectors and resume correspondence promptly in the wake of joining the transmission zone. It was exhibited by system test system 2 (NS2) reproductions that the Sehlabaka *et al.* [19] proposed calculation gave a lessened handover deferral, expanded system throughput and minimized number of lost parcels at different velocities of vehicles and bundle sizes.

3.1. Simulation Environment

In this study, the simulations parameters are taken natural as 15 base stations and 150 subscribers in a small area of 5000 m × 5000 m area in a circumstance was reenacted in MATLAB programming. The shifting time and the total handover operation time were focused on with the support of IEEE 802.16e OFDMA model realized using MATLAB. The pace of SSs was contrasted reliably from 0 - 100 m/sec as a maximum speed, which suggests that both traveler and vehicular advancements of SSs were perceived. The standard parameters are classified in **Table 1**.

Table 1. Standard simulation parameters.

Parameter	Value
No. of Base Stations	15
No. of Mobile Stations	150
Simulation Time	1000 second
Area Range	5000 m × 5000 m
Maximal Velocity	100 m/s
Overlap Range	200 m
Radio Range	1000 meter
Frequency	2.4 GHz

3.2. Analysis

Regardless, in 802.16e such evidently injured looking at is to a degree stayed far from with the SBS once in a while saving and radio information about the neighboring BSs. Similarly, the standard does not clearly indicate the measure of hindrances, which respects the increment in the handover postponement time. Endeavoring activities take in the wake of breaking down. Moreover, the standard does not clearly show the measure of disadvantages. In like way, since all around the checking between times, diverse sorts of transmissions between the MSS and the SBS are carried out; it prompts enormous throughput corruption and particularly hampers the QoS of deferral sensitive foreseeable traffics.

4. Proposed Model Explanation

The SS steers the possible BSS in a need based case, while using pass on proficiency case table and moreover the information of possible BSS furnished with the current BS. In total, the proposed method can minimize the handover grievous deficiency of change with low package hardship degree and subsequently an essentially handover. With this zone, it is showing the urging handover blueprint using versatility diagrams. For the base stations, adaptability specimen tables are well known and utilized with help the smaller stations suspect the checked base stations. The data recorded from the adaptability case table is overhauled all around every suitable handover skeleton depending upon the handover decisions got from additionally unassuming station. The reenactment study shows that our strategy can on sensationally key level decrease handover slowness.

Detailed Design

Within the scheme below, the SS uses the mobility pattern table to predict the mark BS. The mobility pattern table, where the pairs with the previous BS, as well as the target BS, are recorded, is maintained through the serving BS mounted in the center of the cell. Among the mobility pattern, table is shown in **Table 2**, and **Table 3** is produced by the first scan to all base stations by assuming all mobile stations are located in the first cell as shown in **Figure 1**.

The handover times relate to how now and again the adaptability arrangement zone shows up inside a certain period. In the occasion the pass on breaking point outline table is dealt with, the table is void, and table ranges are joined and updated in the handover process. The serving BS then requests if the pair exists in the flexibility sample table. In the event that the pair exists, the handover note worth is reached out by 1; if all else fails, a substitute table section holding the pair of the past base station ID moreover the target base station ID is cemented and in addition the handover respect for the new way is planned to a solitary.

For every one table portion in the adaptability representation table, the serving BS considers the system for past Bsprev and Bsprev; if the nature of previous base station in the table path is the same with the ID of past base station exemplified in the thickness request message, the target BS in such a table distribution is considered as the contender BS, and the concentrate on base station ID is solidified with the chipper BSS rundown. In all probability, examining each of the BSS inside the separating once-over takes truly a while, and that is not preceded in stillness sensitive enduring offers. Inside this response message, the BS encapsulates the exuberant BSS rundown from the lessening ask for on the handover times as demonstrated by the flexibility illustration table.

When the signal strength of the serving BS drops below the predefined signal strength threshold, the mobile station enters the scanning stage to find the next base station to associate with. In any case, the obliging station tries to synchronize with the entire BSS that has the most vital likelihood (centrality this kind of handover decision appeared with most astonishing repeat) and bits of taking in at change physical brilliant information in the certain BS as showed by its most shocking marker quality as indicated in **Figure 2**. Where, **Figure 2** shows the occasion the channel condition fits the need from the adaptable station, the width framework is completed without extra neighbor BS must be analyzed. If all else fails, the flexible station ought to yield the running as a laced unit with BS until the perfect BS is found. The last BS's ID regardless of the concentrate on BS's ID will furthermore be embodied in that message to keep up the adaptability outline table. Precisely when the serving BS perceives the mobile handover interrupt message, it upgrades its portability case table focused around the past base station ID and the concentrate on base station ID as shown in **Table 4**.

Table 2. Obtained table after first scan.

Base Station ID	Avg. Handover Time	Av. Signal Strength	Av. Load	Av. Load Ratio
2	195.90312500	−50.78717594	43.6250	0.218125
3	195.97125000	−50.78717594	43.6250	0.218125
4	197.01312500	−50.78717594	43.6250	0.218125
5	196.96812500	−50.78717594	43.6250	0.218125
6	196.67687500	−50.78717594	43.6250	0.218125
7	196.47000000	−50.78717594	43.6250	0.218125
8	155.14416667	−50.8569515	40.5000	0.2025
9	155.45166667	−50.8569515	40.5000	0.2025
10	155.61083333	−50.8569515	40.5000	0.2025
11	155.02583333	−50.8569515	40.5000	0.2025
12	155.04666667	−50.8569515	40.5000	0.2025
13	155.50916667	−50.8569515	40.5000	0.2025
14	155.61500000	−50.8569515	40.5000	0.2025
15	155.19416667	−50.8569515	40.5000	0.2025

Table 3. Mobility pattern table.

Previous Base Station	Target Base Station	Av. Signal Strength	Av. Load	Av. Load Ratio
8	9	−50.86	40.50	0.2025
8	10	−50.86	40.50	0.2025
8	11	−50.86	40.50	0.2025
8	12	−50.86	40.50	0.2025
8	13	−50.86	40.50	0.2025
8	14	−50.86	40.50	0.2025
8	15	−50.86	40.50	0.2025
8	2	−50.79	43.625	0.2181
8	3	−50.79	43.625	0.2181
8	4	−50.79	43.625	0.2181
8	5	−50.79	43.625	0.2181
8	6	−50.79	43.625	0.2181
8	7	−50.79	43.625	0.2181

Table 4. Obtained table after second scan.

Base Station ID	Avg. Handover Time	Av. Signal Strength	Av. Load	Av. Load Ratio
1	110.5314103	−51.45694641	48.97435897	0.108831911
2	110.5397436	−51.45694641	48.97435897	0.108831911
3	110.9121795	−51.45694641	48.97435897	0.108831911
4	111.1455128	−51.45694641	48.97435897	0.108831911
5	111.6628205	−51.45694641	48.97435897	0.108831911
6	112.2275641	−51.45694641	48.97435897	0.108831911
7	112.0929487	−51.45694641	48.97435897	0.108831911
9	111.4365385	−51.45694641	48.97435897	0.108831911
10	111.8356688	−51.3709758	48.98089172	0.108846428
11	111.0141935	−51.54402632	48.96774194	0.108817206
12	111.0474359	−51.45694641	48.97435897	0.108831911
13	109.9897436	−51.45694641	48.97435897	0.108831911
14	110.4237179	−51.45694641	48.97435897	0.108831911
15	110.5685897	−51.45694641	48.97435897	0.108831911

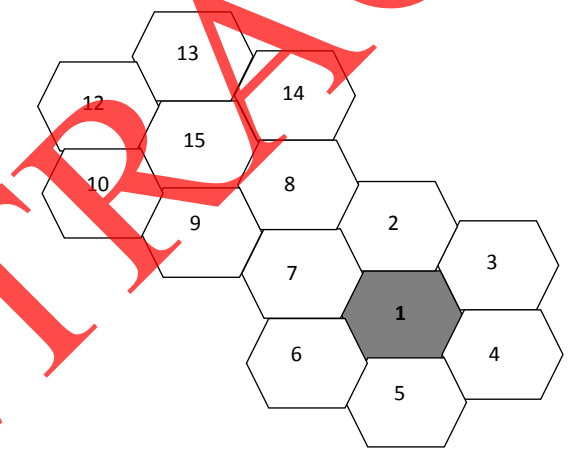

Figure 1. Cell distribution.

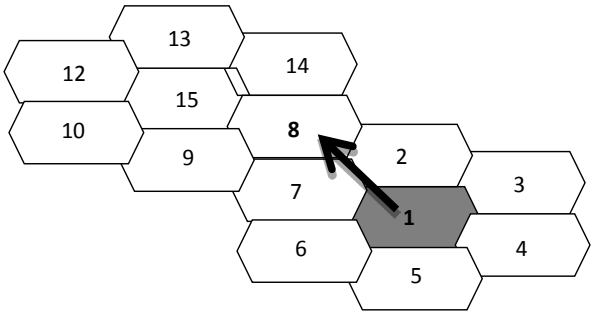

Figure 2. Decision made according to signal strength.

Then again, it is in like way possible that this transportability case table isn't right or holds bafflement. Notwithstanding, the gage is misguided regardless of the flexible station would attempt to yield a mixed up BS. Since the achieve will miss the mark under such a condition, the adaptable station needs to complete the imperative yield technique gather the adaptability sample table concentrated on the standard broadening results.

In like way, when the current BS gets the mobile handover interrupt message, the serving BS will actuate a huge allotment of the downlink packs to the new BS of the adaptable station, in light of the route that in the wake of sending the mobile handover interrupt message, the accommodating station will withdraw from the serving BS and all correspondences between the versatile station and the serving BS be interfered. The target BS holds the downlink gatherings of the versatile station clearly, and when the acquaintanceship between the accommodating station and the target BS is made, the target BS progresses the set away packages to the adaptable station. After the target BS is dead masterminded, the outline layer handover could be authorized to minimize the total handover absence of movement as demonstrated in **Figure 3**.

Where **Figure 3** explains the movement of the MS as initially in cell number two which is the second step after the initial process, and in accordance to the obtained **Table 5**, where the consideration of the signal strength to move to BS number three.

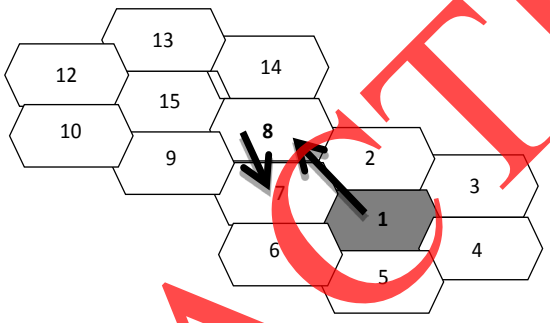

Figure 3. Mobile subscriber movements.

Table 5. Mobility pattern table.

Base Station ID	Avg. Handover Time	Av. Signal Strength	Av. Load	Av. Load Ratio
2	195.9031	−50.7871	43.6250	0.218125
3	195.9712	−50.7871	43.6250	0.218125
4	197.0131	−50.7871	43.6250	0.218125
5	196.9681	−50.7871	43.6250	0.218125
6	196.6768	−50.7871	43.6250	0.218125
7	196.4700	−50.7871	43.6250	0.218125
8	155.1441	−50.856	40.5000	0.2025
9	155.4516	−50.856	40.5000	0.2025
10	155.6108	−50.856	40.5000	0.2025
11	155.0258	−50.856	40.5000	0.2025
12	155.0466	−50.856	40.5000	0.2025
13	155.5091	−50.856	40.5000	0.2025
14	155.6150	−50.856	40.5000	0.2025
15	155.1941	−50.856	40.5000	0.2025

5. Simulation Results

5.1. Simulation Setup

The simulation in this thesis involves examining how a hundred and fifteen MS can move across a fifteen BSs at various speed in random process using the parameters shown in **Table 6**.

The simulation was examined using ready software MATLAB. The movements started from cell number one as a reference step upward to the 8th BS randomly according to the following steps:

First scan process was done to all BSs to produce the initial mobility table as shown in **Table 7**, where the scan is done almost 1924 times to produce the first list, this number of scan is done because the mobile will be stable when more number of scans is done.

Taking first scan into consideration to generate the first mobility list, and according to signal strength to determine the target BS, as shown in **Table 8**.

Load ratio is taken 0.0 till 0.5, where the BS capacity is taken 200 MSs, where the load ratio for each step, a

Table 6. Simulation parameters.

Parameter	Value
No. of Base Stations	15
No. of Mobile Stations	150
Simulation Time	1000 second
Area Range	5 Km × 5 Km
Maximal Velocity	15 m/s
Overlap Range	200 m
Radio Range	1 Km
Frequency	2.4 GHz

Table 7. Produced mobility pattern table.

Previous Base Station	Target Base Station	Av. Handover	Av. Signal Strength	Av. Load Ratio
8	7	0.1120929487	−51.45694641	0.000004897
8	6	0.1122275641	−51.45694641	0.000004897
8	10	0.1118356687	−51.37097579	0.000004898
8	5	0.1116628205	−51.45694641	0.000004897
8	4	0.1111455128	−51.45694641	0.000004897
8	12	0.1110474358	−51.45694641	0.000004897
8	11	0.1110141935	−51.54402632	0.000004896
8	3	0.1109121794	−51.45694641	0.000004897
8	2	0.1105397435	−51.45694641	0.000004897
8	1	0.1105314102	−51.45694641	0.000004897
8	15	0.1105685897	−51.4569464	0.000004897
8	14	0.1104237179	−51.4569464	0.000004897
8	13	0.1099897435	−51.4569464	0.000004897

scan is done to collect the data to obtain **Figure 4**. Where, **Figure 4** shows the results of the first handover time delay, and its maximum value is 197 ms.

Second scan process was done to all BSs to produce the initial mobility table as shown in **Table 9**, where the scan is done almost 2188 times to produce the second list, this number of scan is done again for the same reason in the first scan which is the mobile will be more stable when done more number of scans.

Again, load ratio is taken 0.0 till 0.5, where the BS capacity is taken 45 MSs, where the load ratio for each step, a scan is done to collect the data. The obtained data is plotted as shown in **Figure 5** below to show the second handover time delay, maximum 111 ms.

Table 8. Mobility pattern list (according to signal strength).

Previous Base Station	Target Base Station	Av. Signal Strength	Av. Load	Av. Load Ratio
8	9	−50.86	40.50	0.2025
8	10	−50.86	40.50	0.2025
8	11	−50.86	40.50	0.2025
8	12	−50.86	40.50	0.2025
8	13	−50.86	40.50	0.2025
8	14	−50.86	40.50	0.2025
8	15	−50.86	40.50	0.2025
8	2	−50.79	43.625	0.2181
8	3	−50.79	43.625	0.2181
8	4	−50.79	43.625	0.2181
8	5	−50.79	43.625	0.2181
8	6	−50.79	43.625	0.2181
8	7	−50.79	43.625	0.2181

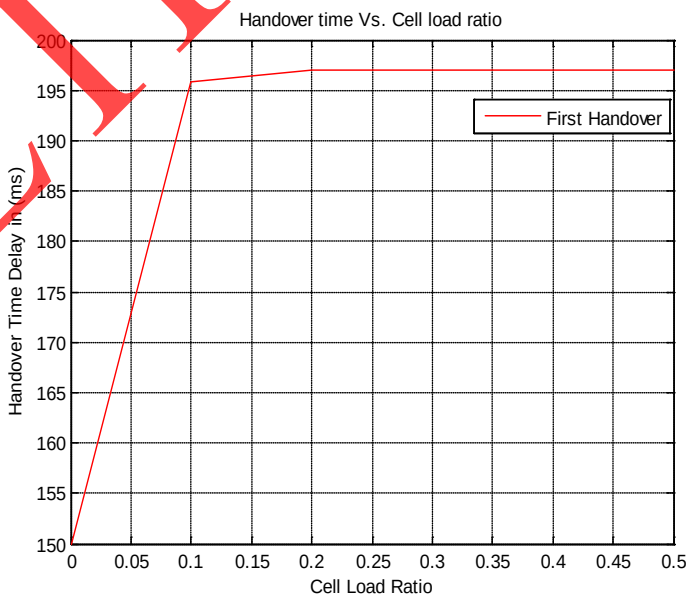

Figure 4. Handover latency vs. load ratio.

Table 9. Produced mobility pattern table.

Base Station ID	Avg. Handover Time	Av. Signal Strength	Av. Load	Av. Load Ratio
1	110.531	−51.4569	48.9743	0.108831911
2	110.539	−51.4569	48.9743	0.108831911
3	110.912	−51.4569	48.9743	0.108831911
4	111.145	−51.4569	48.9743	0.108831911
5	111.662	−51.4569	48.9743	0.108831911
6	112.227	−51.4569	48.9743	0.108831911
7	112.092	−51.4569	48.9743	0.108831911
9	111.436	−51.4569	48.9743	0.108831911
10	111.835	−51.370	48.9808	0.108846428
11	111.014	−51.5440	48.9677	0.108817206
12	111.047	−51.4569	48.9743	0.108831911
13	109.989	−51.4569	48.9743	0.108831911
14	110.423	−51.4561	48.9743	0.108831911
15	110.568	−51.4561	48.9743	0.108831911

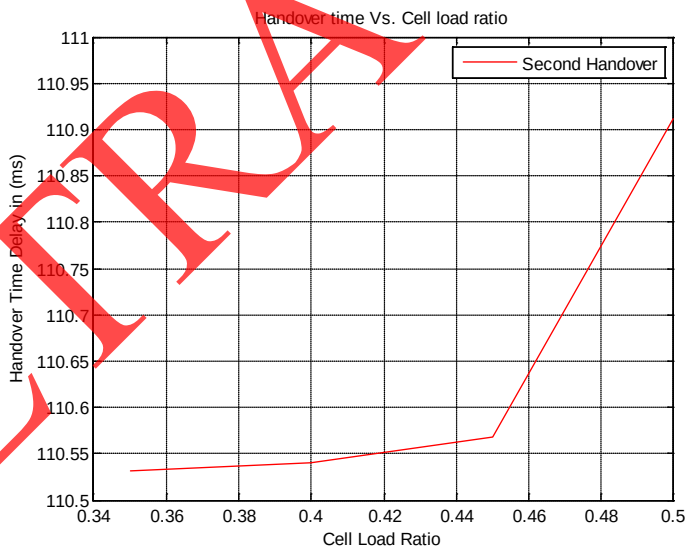

Figure 5. Handover latency vs. cell load ratio (second scan).

Comparison between the first and second handovers is done and shown in **Figure 6**, showing a big difference between the two scans. Call drop probability is tabulated with respect to the cell load ratio, and plotted as shown in **Figure 7**.

5.2. Simulation Results

Simulation results are generated using a number of program executions, where the objective of the proposed model is to understand the effective of the proposed algorithm to reduce the handover time delay. The proposed

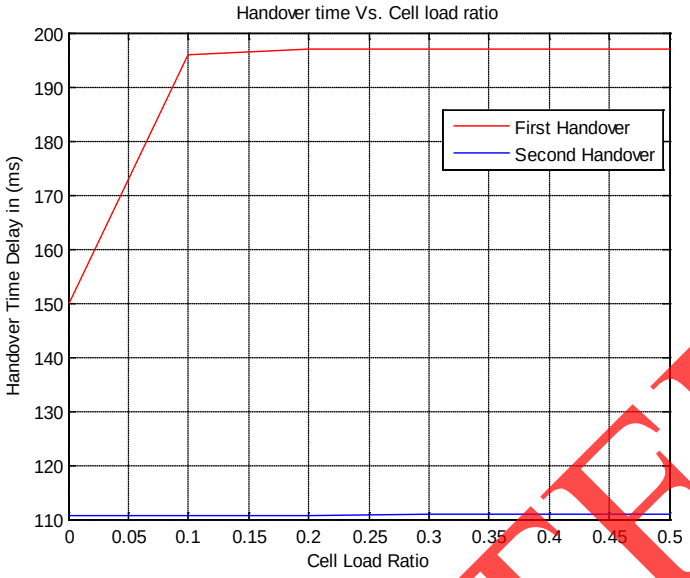

Figure 6. Comparison between first and second handover.

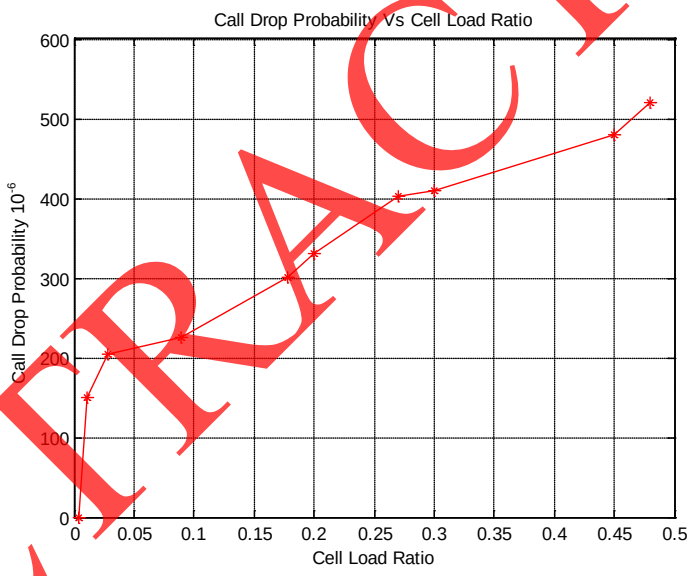

Figure 7. Call drop probability vs. cell load ratio.

model got the following results, as shown in **Figure 8**, the coordinates of the mobile station (MS) with respect to the nearest base stations (BSs), where these coordinates are tabulated in **Table 10**.

The new location of the MS is shown in **Figure 9**.

The mobile stations (MSs) are moved to the target base station (BS), as shown in **Figure 10**.

According to the results obtained from the proposed model, and comparing with the results obtained in Zhang *et al.* [20], and by using the same parameters. It is found that the handover time delay reduced to 111 ms in the proposed model, while in Zhang *et al.* [20] is found to be 197 ms. Which gives a note that the proposed model is higher quality and more effective.

6. Conclusion

To develop a WMN, WiMAX innovation is mainstream to give remote associations in light of the fact that WiMAX has bigger radio extend as opposed to WiFi. Then again, radio stations extent stays to be restricted and

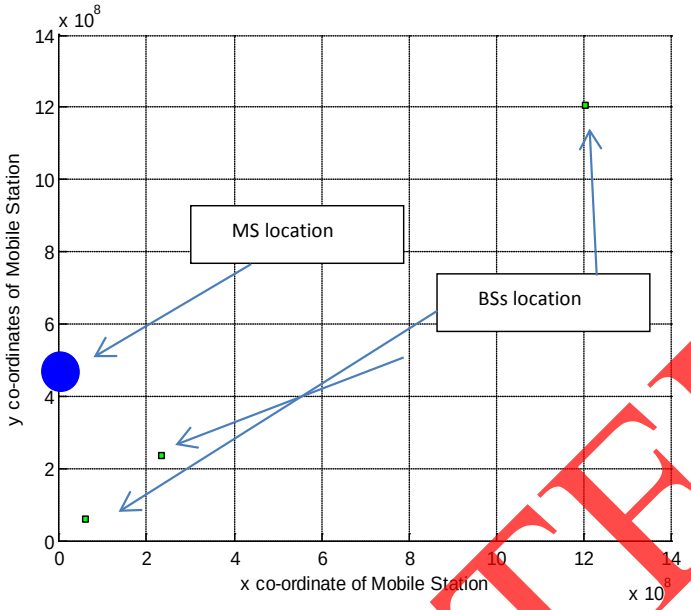

Figure 8. MS & BSs coordinates.

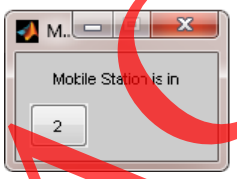

Figure 9. Mobile station's new location.

Table 10. Table of the extractions.

Signal Strengths	Distances	Handover Time
−57.8400	15331.9992	110.5314
−57.0200	7741.4777	110.5397
−55.9100	34715.2311	110.9122
−54.8400	45247.3229	111.1455
−53.4200	31251.7785	111.6628
−51.9300	44634.1075	112.2276
−49.9100	10900.5718	112.0929
−47.5000	38149.2551	111.4365
−43.8900	18334.1673	111.8357
−37.9600	21947.4815	111.0142
−49.9100	8804.9854	111.0474
−47.5000	40939.2001	109.9897
−43.8900	31883.8482	110.4237
−37.9600	37215.4334	110.5686

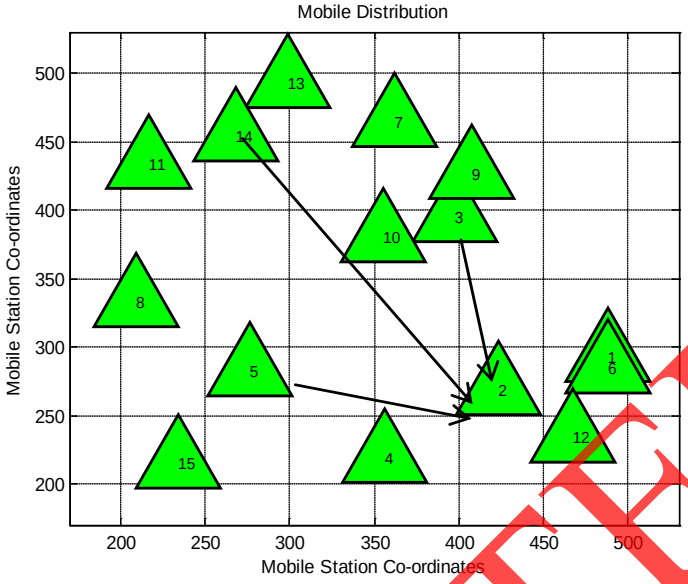

Figure 10. Mobile stations (MSs) movements to the target base station (BS).

Table 11. Comparison table.

No	REF	Handover Time	BS	MS
1	[20]	197 ms	15	150
3	[18]	129	14	10
4	Proposed System	111	15	150

handover methodologies are required to keep up remote associations. Hence, giving quick handovers in WiMAX organizes under the precise quick condition has formed into testing assignment. On this postulation, a productive MAC layer handover plan utilizing versatility examples is introduced to decrease the handover dormancy. Portability examples are embraced to help the SS anticipate the target BS and minimize the filtering time. Reenactment effects exhibit that our plan can lessen the handover dormancy fundamentally which is the important point in cloud computing to obtain more effective results in minimum required time. In this paper, the proposed model decreased handover dormancy time by an acceptable percentage in comparison with Zhang *et al.*, [20]. The comparison is done and tabulated as shown in **Table 11**.

References

[1] Hyeyeon, K., Yang, M., Park, A. and Venkateasan, S. (2008) Handover Prediction Strategy for 3G-WLAN Overlay Networks. *IEEE Explore, Digital Library. Network Operations and Management Symposium, NOMS* 2008. Ministry of Information and Communication Republic of Korea and Institute for Information Technology Advancement, 819-822.

[2] Vasos, V. and Zinonos, Z. (2009) An Analysis of the Handover Latency Components in Mobile IPv6. *Journal of Internet Engineering*, **3**, 230-240.

[3] Khan, J. (2010) Handover Management in GSM Cellular System. *International Journal of Computer Application*, **8**, 14-24. http://dx.doi.org/10.5120/1257-1763

[4] Tripathi, N.D., Reed, J.H. and VanLandingham, H.F. (1998) Handoff in Cellular Systems. *IEEE Personal Communications*, 26-37.

[5] Wong, M., Yee, K. and Turner, P. (2008) A Structured Evidence-Based Literature Review Regarding the Effectiveness of Improvement Interventions in Clinical Handover. The eHealth Services Research Group, University of Tasmania for the Australian Commission on Safety and Quality in Health Care (ACSQHC), Australia, 2-140.

[6] Pandey, P.S. and Badal, N. (2012) Viable Modifications to Improve Handover Latency in MIPv6. *International Jour-*

nal of Advanced Computer Science and Application, **3**, 121-125.

[7] Hsieh, R. and Seneviratne, A. (2003) A Comparison of Mechanisms for Improving Mobile IP Handoff Latency for End-to-End TCP. *MobiCom* '03 *Proceedings of the* 9*th Annual International Conference on Mobile Computing and Networking*, ACM, New York, 29-41.

[8] Fu, S. and Atiquzzaman, M. (2005) Handover Latency Comparison of SIGMA, FMIPv6, HMIPv6, and FHMIPv6. Telecommunication & Network Research Lab School of Computer Science, The University of Oklahoma, Norman, 1-7.

[9] Mortaza, S.B., Heijenk, G.B., Laganier, J. and Anand, R. (2008) Reducing Handover Latency in Future IP-Based Wireless Networks: Proxy Mobile IPv6 with Simultaneous Bindings. *Proceeding of International Symposium on a World of Wireless, Mobile and Multimedia Networks*, Newport Beach, 1-10.

[10] Chao, M.W., Yee, K. and Turner, P. (2008) The eHealth Services Research Group, University of Tasmania for the Australian Commission on Safety and Quality in Health Care. University of Tasmania, Tasmania, 3-252.

[11] Purnendu, S.P. and Neelendra, B. (2012) Viable Modifications to Improve Handover Latency in MIPv6. *International* (*IJACSA*) *International Journal of Advanced Computer Science and Applications*, **3**, 121-125. www.ijacsa.thesai.org

[12] Abduloulaziz, I.H., Renfa, L. and Fanzi, Z. (2012) Handover Necessity Estimation for 4G Hesterogeneous Networks. *International Journal of Information Sciences and Techniques*, **2**, 1-13. http://dx.doi.org/10.5121/ijist.2012.2101

[13] Akki, C.B. and Chadchan, S.M. (2009) The Survey of Handoff Issues in Wireless ATM Networks. *International Journal of Nonlinear Science*, **7**, 189-200.

[14] Hu, Y. and Li, V.O. (2001) Logical Topology-Based Routing in LEO Constellations. *Proceeding of International Conference on Communications, ICC* 2001. *IEEE*, Helsinki, 3172-3176.

[15] Mushtaq, M., Arman, K. and Ismail, F. (2011) Seamless Handover between UMTS and GPRS. *International Journal of Communication Network and Security*, **1**, 1-4.

[16] An, Y.Y., Yae, B.H., Lee, K.W., Cho, Y.Z. and Jung, W.Y. (2006) Reduction of Handover Latency Using MIH Services in MIPv6. 20*th International Conference on Advanced Information Networking and Applications*, 2006. *AINA* 2006, Vol. 2, Vienna, 18-20 April 2006, 229-234.

[17] Vasos, V. and Zinonos, Z. (2009) An Analysis of the Handover Latency Components in Mobile IPv6. *Journal of Internet Engineering*, **3**, 230-240.

[18] Shin, S., Forte, A.G., Rawat, A.S. and Schulzrinne, H. (2004) Reducing MAC Layer Handoff Latency in IEEE 802.11 Wireless LANs. *Proceedings of the 2nd International Workshop on Mobility Management & Wireless Access Protocols*, *MobiWac*'04, 1 October 2004, Philadelphia, 19-26.

[19] Sehlabaka, N.S. and Kogeda, O.P. (2013) A Cross-Layer Based Enhanced Handover Scheme Design in Vehicular *Ad Hoc* Networks. *Proceedings of the World Congress on Engineering and Computer Science*.

[20] Zhang, Z., Pazzi, R.W., Boukerche, A. and Landfeldt, B. (2010) Reducing Handoff Latency for WiMAX Networks Using Mobility Patterns. *Wireless Communications and Networking Conference* (*WCNC*), *IEEE*, Sydney, 1-6.

Scientific Research Publishing (SCIRP) is one of the largest Open Access journal publishers. It is currently publishing more than 200 open access, online, peer-reviewed journals covering a wide range of academic disciplines. SCIRP serves the worldwide academic communities and contributes to the progress and application of science with its publication.

Other selected journals from SCIRP are listed as below. Submit your manuscript to us via either submit@scirp.org or Online Submission Portal.