IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.39 ⁜ Vol. 11, Issue 8, August 2022

DOI: 10.17148/IJARCCE.2022.11806

Solution for a Proper Utilization of Bandwidth in the Area of Mobile Internet

Mohammad Ullah Al Amin[1] (Thesis Student), Mohammad Arifin Rahman Khan[2] (Principal Supervisor), Md. Sadiq Iqbal[3], Mohammed Ibrahim Hussain[4]

Student, Department of Computer Science and Engineering, Bangladesh University, Dhaka, Bangladesh[1]

Lecturer, Department of Computer Science and Engineering, Bangladesh University, Dhaka, Bangladesh[2]

Associate Professor, Department of Computer Science and Engineering, Bangladesh University, Dhaka, Bangladesh[3]

Assistant Professor, Department of Computer Science and Engineering, Bangladesh University, Dhaka, Bangladesh[4]

Abstract: Mobile Internet is that category of service which the people can operate from their smartphone or any kind of mobile device not only to communicate with anywhere in the world, but also getting benefits in the field of education, E-commerce, social-network etcetera through internet according to their needs. Moreover, in the period of emergency time, i.e. "COVID-19" it has also seen that, the people of the world successfully communicated with the sector of medical service for their health and safety in whole 24 hours. But, without the proper utilization of bandwidth, it will be possible to ineffective for getting the people's benefit from the Mobile Internet because firstly, bandwidth is very expensive, and secondly, without bandwidth the Mobile Internet is useless. Therefore, we have proposed a solution for a proper utilization of bandwidth for the area of Mobile Internet, which will provide the best utilization of bandwidth for the user of Mobile Internet and also influences to protect the unnecessary bandwidth and money waste.

Keywords: Bandwidth, Mobile Internet, Internet Traffic, Internet Users.

I. INTRODUCTION

According to the report from Statisca in 2022 (fig. 1), almost 5 billion technology users are using the internet where almost 4.65 billion of users are involved like an active user in the field of social media [1]. Moreover, in generally internet traffic is able to break down into 3 different categories i.e., (i) Mobile Internet traffic, (ii) Desktop Internet traffic, and (iii) Tablet Internet traffic.

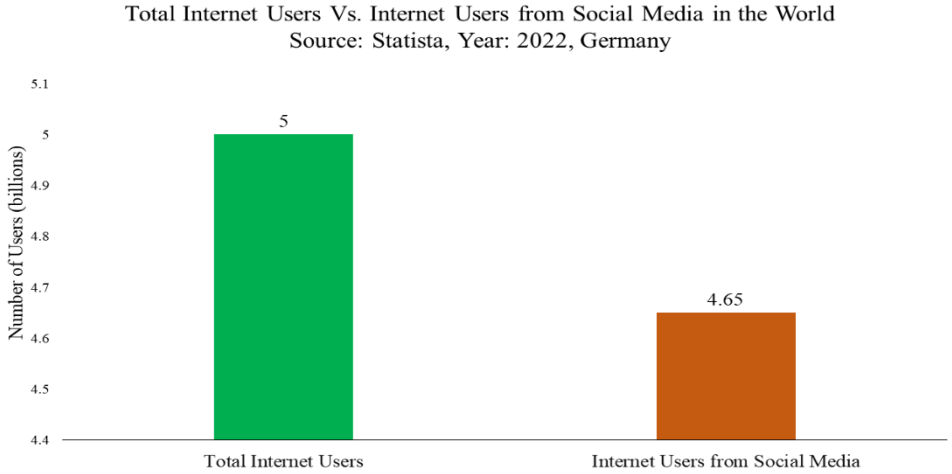

Fig. 1: The comparison report between the total number of Internet Users and Internet Users from the social media for the year of 2022.

According to that information, our investigation has achieved a statistics report from Statistica in 2020 (fig. 2), where we have seen that almost 50.88% internet user has used the internet from the Mobile Data, 46.39% internet users has used the internet from their Desktop, and 2.74% of internet users has used their internet from their Tablet [2]. Therefore, we can say that the Mobile Internet will provide a vital role for the area of Internet users in future. Moreover, without available bandwidth, it will not be possible for the huge number of Mobile Internet Users to provide better successful data transfer [3] in future.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.39 ⁜ Vol. 11, Issue 8, August 2022

DOI: 10.17148/IJARCCE.2022.11806

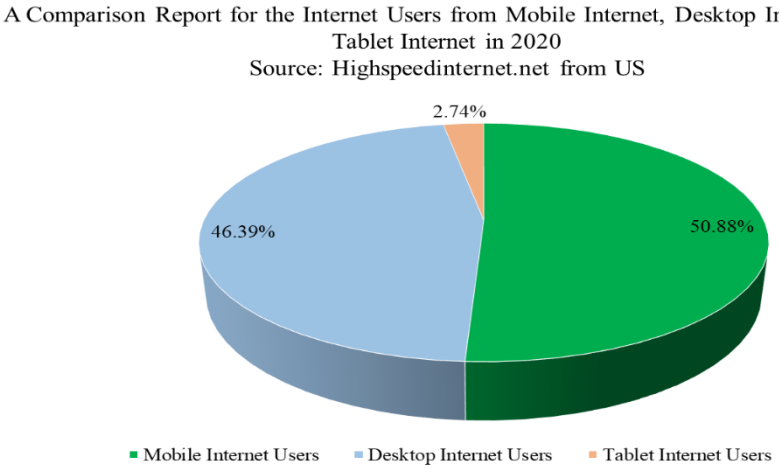

Fig. 2: A comparison Scenario between the Internet Users from Mobile Internet, Desktop Internet, and the internet users from Tablet for the year of 2020.

According to the above discussion, our investigation proposed a solution for utilizing the bandwidth properly for the Mobile Internet User where each and every Mobile Internet user will get available bandwidth for their successful communication via Mobile Internet. Moreover, according to our proposed algorithm it is also possible to protect unnecessary bandwidth waste using Extra Bandwidth Store technique where this will also effect to the money save.

II. BACKGROUND AND LITERATURE REVIEW

The sector of Mobile Internet is an arising data innovation rising up out of the use of 3G (Third Generation) of Mobile Communication Systems. According to those field, benefits people and associations in numerous ways, for example, in business and communication, research and education, the network of community, medical science, entertainment and advertising and so on [4] [5].

Bandwidth is truly the amount of information that may be sent from one connection to another in a given amount of time, commonly measured in Kbps (kilobits in step with 2nd), Mbps (megabits per 2nd), or Gbps (gigabits per second) [6]. Bandwidth is an essential factor in terms of figuring out the pleasant and speed of a mobile network or internet connection. Essentially, the better the bandwidth, the quicker and greater green your mobile internet or mobile voice could be [7]. Bandwidth is vital for determining how rapid an internet page masses for your browser. Similarly, as a quick web association will permit the internet user to transfer their items faster, higher data transmission will successfully work on the quality and client experience of your site [6].

In literature, according to the study in [8], it has observed that the author shows, the management of bandwidth in remote sensor networks primarily based on probabilistic technique. The data transfer capacity project using clusters in wireless sensor networks is examines in [9]. In [10] the author presents by their proposed algorithm for the allocation of bandwidth to both ongoing/non continuous correspondences in the sensor of networks. In [11] the writer has proposed a mechanism for the heterogeneous wireless networks using the efficient multicast technique of bandwidth. The main theory for their mechanism is that, bandwidth has saved from the fewer cells using clustering with the mobile nodes together.

III. PROBLEM FINDINGS

According to the scenario of mobile active subscribers in Bangladesh from the year of 2013 to 2021 [12], it has been seen by the fig.3 that, normally 4 different categories of mobile operators are available in Bangladesh which are GrameenPhone Ltd. (GP), Robi Axiata Limited (Robi), Banglalink Digital Communications Limited, and Teletalk Bangladesh Ltd., where the scenario of fig.3 has shown that, GP has the maximum number of mobile active subscribers compared to the others 3 mobile operators. If will observed with consciously about the status of mobile active subscriber for the mobile operator named GP, then it has to found that the rate of mobile active subscriber has increased in continuous way from the year of 2013 to 2021 [12], which shows clearly to us that, the demand of mobile communication is huge for the sector of mobile technology in Bangladesh.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.39 ⁜ Vol. 11, Issue 8, August 2022

DOI: 10.17148/IJARCCE.2022.11806

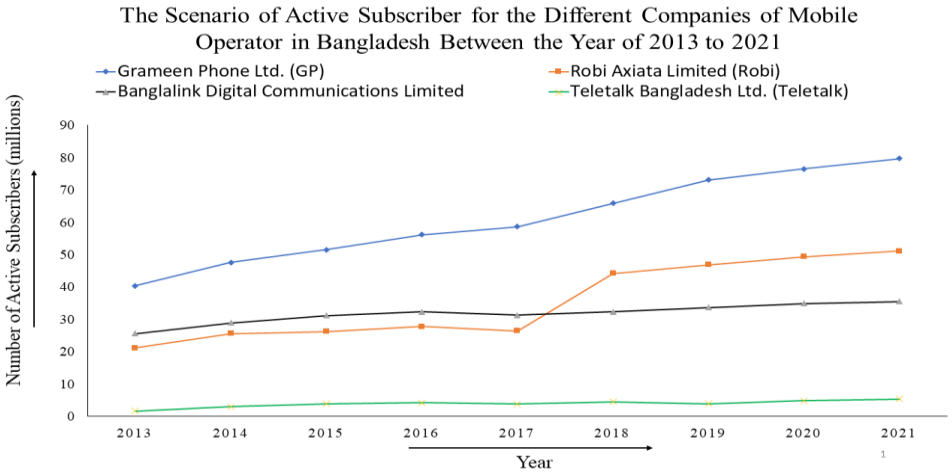

Fig. 3: The Scenario of Active Subscriber for the Different categories of Mobile Companies in Bangladesh from the Year of 2013 to 2021.

Moreover, the practical scenario of Average Mobile Internet User in Bangladesh also reflected by the fig.4, where it has seen with clearly that from the year of 2014 to 2016 [13], the Average Mobile Internet User is increased dramatically, furthermore gradually increased also has observed from the year of 2018 to 2021 [13]. Therefore, according to the fig.4 it can say with easily that, a good number of people they are connected with internet by Mobile data in Bangladesh.

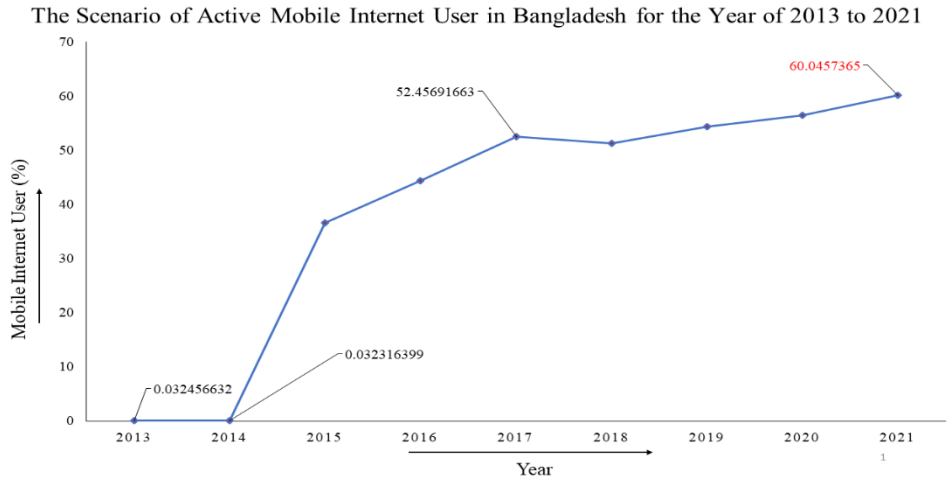

Fig. 4: The Scenario of Active Mobile Internet User in Bangladesh. (Year of 2013 to 2021).

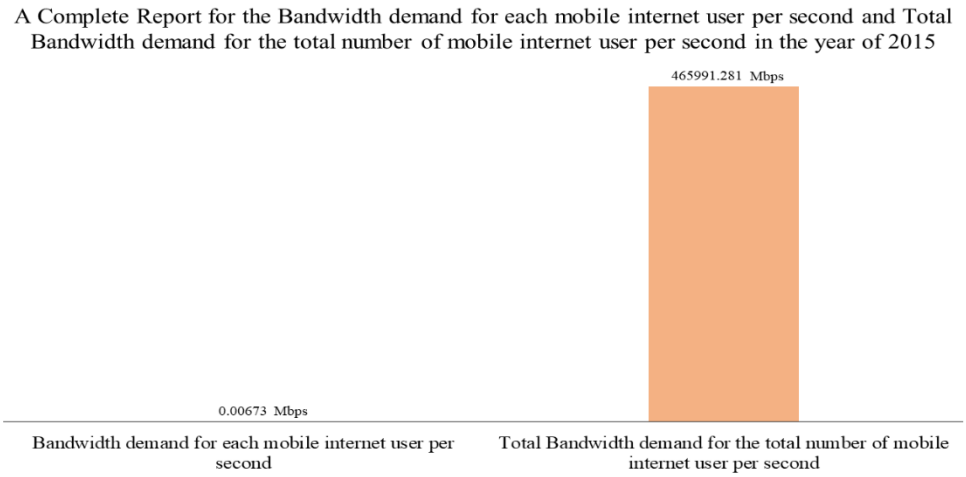

Fig. 5: A Complete Report for the demand of bandwidth for a single mobile internet user in a second and the total bandwidth demand for the gross number of mobile internet user in a second for the year of 2015

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.39 ⁜ Vol. 11, Issue 8, August 2022

DOI: 10.17148/IJARCCE.2022.11806

According to the fig.5 it has observed that, the bandwidth demand for a single mobile internet user in a second for the people of Bangladesh has recorded by 0.00673 Mbps [14], where another report has shown that, the total bandwidth demand for the total number of mobile internet user has recorded by 465991.281 Mbps [13-14] in a second for the Bangladesh people. On the other hand, from the fig.6, it has detected that, total cost 291244550.6 BDT [13-15] was used by that total number of Mobile Internet Users in Bangladesh in the year of 2015 [13-15].

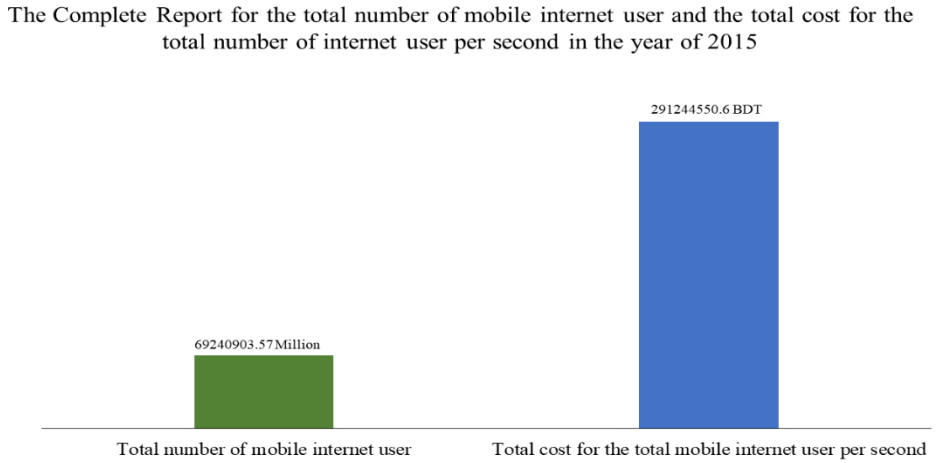

Fig. 6: The Complete Report for the total number of mobile internet user and the total cost for the total number of internet user in a second. (Year of 2015).

According to the above explanation, it can be observed that the possible unnecessary waste of bandwidth from the sector of Mobile Internet in Bangladesh causes a possible of huge amount of money waste which will provide a bad impact on the sector of finance in Bangladesh also may with the others country in the world. Therefore, our investigation has proposed an algorithm which will have able to provide a proper utilization of bandwidth for the sector of Mobile Internet and will also protect the unnecessary bandwidth and money waste.

IV. METHODOLOGY

According to the problems of possible unnecessary bandwidth waste we propose the below algorithm, where we have used a technique of Extra Bandwidth Save.

Algorithm1: Proper Utilization of Bandwidth for the area of Mobile Internet.

(1) **Input:**
  Total number of Mobile Internet User, M_U
  Available Bandwidth for the Mobile Internet User, B_A
  Fixed Bandwidth for all the Mobile Internet User, B_F
  Bandwidth Demand for the Current Mobile User, B_D
(2) If $B_F > B_D$ then
(3) Calculate the Extra Store Bandwidth, $S_B^E \leftarrow B_F - B_D$
(4) If End the Current Mobile Internet Mobile User then
(5) Goto the next New Mobile Internet User
(6) Else Stop
(7) Else calculate the Extra need of Bandwidth (B_N^E) for the current Mobile Internet Mobile User $B_N^E \leftarrow B_D - B_F$
(8) If first Mobile Internet User then
(9) Fulfil the Extra need of Bandwidth (B_N^E) from the Available Bandwidth (B_A) and Goto the next new Mobile Internet User and Calculate $B_A^N \leftarrow \{B_A - B_N^E\}$, set $S_B^E \leftarrow 0$ for the next new Mobile Internet User
(10) Else
(11) If $B_N^E < S_B^E$ then
(12) Fulfil the B_N^E from S_B^E and calculate, $S_B^{E,N} \leftarrow S_B^E - B_N^E$ for the next new Mobile Internet User
(13) Goto the next new Mobile Internet User
(14) Else fulfil the B_A^N from S_B^E and B_A.
(15) Calculate New Bandwidth Available, $B_A^N \leftarrow \{B_A - (B_N^E - S_B^E)\}$ and set $S_B^E \leftarrow 0$, for the next new Mobile Internet User

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.39 ⁜ Vol. 11, Issue 8, August 2022

DOI: 10.17148/IJARCCE.2022.11806

According to the proposed algorithm1, the total number of Mobile User has been mentioned by M_U, where the available bandwidth for those M_U is indicated by B_A. We have assumed that each and every current Mobile Internet User has a fixed bandwidth demand which is indicated by B_F.

We have proposed an algorithm1 using a technique of Extra Store Bandwidth, S_B^E where if the current demand of bandwidth (B_D) for a customer is lower than the fixed bandwidth demand (B_F) of customer then the excess bandwidth will not only protect their possible unnecessary bandwidth and money waste but also that excess bandwidth will consider by S_B^E which will help for the next Mobile Internet User if that user will need extra bandwidth compare than his current needs (fig.7).

V. RESULT DISCUSSION

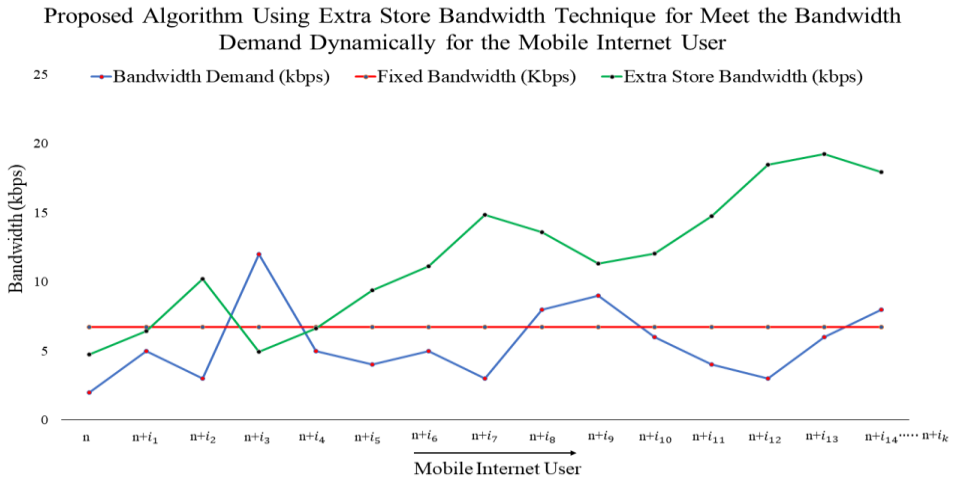

Fig. 7: Evaluation the result from the proposed algorithm using Extra Store Bandwidth technique for meet the bandwidth demand dynamically for the Mobile Internet.

According to fig.7, ours proposed algorithm1 has focused by three different meaning of curve lines where, the red colour has mentioned by the fixed demand of bandwidth for a customer, the blue line is indicated by the demand of bandwidth for the current mobile inter user, and the green line presented by the Extra Store Bandwidth.

According to ours finding fig.7, where the X axis presents the status of customer where n (i.e., n=1) means the starting number of customer and i means the status of number of next customers i.e., $i = i_1 + i_2 + i_3 + \cdots + i_k$; where, $i_1 = 1, i_2 = 2$ and so on. Moreover, Y axis has evaluated by the unit of Bandwidth in Kbps (Kilobit per second).

As a proper discussion from ours proposed algorithm and result, it has seen that, Extra Store Bandwidth is provided a great support for fulfill a dynamic bandwidth demand for the customer, which happening to the better utilize the bandwidth and causes prevent the unnecessary bandwidth waste, and also protect the unnecessary money cost for the user of Mobile Internet.

VI. CONCLUSION

According to the needs of human life, the importance of Mobile Internet is infinity. If we will want to proper useful this field for everyone, then we will need to concentrate to the proper utilization of bandwidth. Therefore, our investigation has proposed an algorithm using a technique of Extra Store Bandwidth where each and every Mobile Internet user will get proper utilization of bandwidth for a non-stop internet use via their smartphone according to their needs.

REFERENCES

[1] L. Ceci,"Mobile internet usage worldwide," Statista Inc.Statista GmbH, Johannes-Brahms-Platz 1, 20355 Hamburg, Germany, pages: 66, Feb22, 2022. Online Available: https://www.statista.com/topics/779/mobile-internet/#dossierContents__outerWrapper

[2] Internet comparison site in the US, "Desktop and Mobile Internet Usage Statistics 2020," highspeedinternet.net, United States, 2020, Online Available: https://www.highspeedinternet.net/desktop-and-mobile-internet-usage-statistics/

[3] H. Haryono and D. Gunawan, "Fulfillment Bandwidth Requirement Analysis of Access Transmission Cellular Network," 2020 IEEE International Conference on Communication, Networks and Satellite (Comnetsat), 2020, pp. 362-367, doi: 10.1109/Comnetsat50391.2020.9329008.

DOI: 10.17148/IJARCCE.2022.11806

[4] Online Available: https://www.finder.com/ca/internet-plans/mobile-internet
[5] J, Anne, "Mobile Internet," International Journal of Mobile Human Computer Interaction. Year 2011, 1. 29-45. 10.4018/jmhci.2009070104.
[6] Online Available: https://bionic.co.uk/business-connectivity/guides/what-is-bandwidth/
[7] M. Arifin Rahman Khan, M. Golam Kaosar, M. Shorfuzzaman and K. Jakimoski, "A new handover management model for two-tier 5g mobile networks," Computers, Materials & Continua, vol. 71, no.3, pp. 5491–5509, 2022.
[8] Dawood. K, Bilel. N, Luca. S, YeQiong. S, "Probabilistic Bandwidth Assignment in Wireless Sensor Networks", in proceedings of International Conference on Wireless Algorithms, Systems, and Applications, pp. 631-647, 2012.
[9] Tarek. A, Rachid. B, Mourad. O, "Bandwidth Assignment in a Cluster-based Wireless Sensor Network", in proceedings of the World Congress on Engineering, vol. 2, pp. 1- 6, 2013.
[10] Shashi Prabh. K, "Bandwidth Allocation in Hexagonal Wireless Sensor Networks for Real-Time Communications", in proceedings of International Conference on Networking, Sensing, and Control, pp. 1- 6, 2011.
[11] De-Nian. Y, Ming-Syan. C, "Efficient Resource Allocation for Wireless Multicast," IEEE Transactions on Mobile Computing, vol. 7, no. 4, pp. 387-400, 2008.
[12] Bangladesh Telecommunication Regulatory Commission (BTRC), "Mobile Phone Subscribers in Bangladesh," Report of year 2013-2021, IEB Bhaban, Ramna, Dhaka-1000, Bangladesh. Available Online: www.btrc.gov.bd/content/mobile-phone-subscribers-bangladesh-january
[13] Bangladesh Telecommunication Regulatory Commission (BTRC), "Mobile Phone Subscribers in Bangladesh," Report of year 2013-2021, IEB Bhaban, Ramna, Dhaka-1000, Bangladesh. Available Online: http://www.btrc.gov.bd/content/internet-subscribers-bangladesh-january
[14] Available Online: https://www.theglobaleconomy.com/rankings/Internet_bandwidth/Asia/#Bangladesh
[15] Available Online: https://www.theindependentbd.com/post/13999

BIOGRAPHY

He is the final year thesis student of Bangladesh University under the course of B. Sc in Computer Science and Engineering. This paper publishes from his thesis work. In future he wants to work in communication technologies to earn a lot of knowledge about the field of wireless communication.

He acts as a thesis supervisor for this paper. His Nominated profile has been selected for the "International Research Awards on Cardiology and Cardiovascular Medicine" under the category of "Excellence in Research" for 12th Edition of CCM. He has Received his Research degree from Edith Cowan University, Australia in 2019 and has completed the M.Sc. degree from London Metropolitan University, London, UK in 2010. As well as, he has made to upgrade his professional career by the specialized certificate CCNA from CISCO. He is also working with the International Journal of Computer Science and Business Informatics (IJCSBI) like an Associate Editor. His research interests include mobility management, multimedia transmission, and quality-of-service (QoS) etc. provision issues in the next-generation of communication technologies.

He has completed his Masters in Computer Science and Engineering degree from National Technical University in Ukraine, Ukraine. Moreover his B.Sc in Computer Science and Engineering has completed from the same university. At the moment he is involved in the Center for Excellence in Research, Entrepreneurship & Teaching at Bangladesh University, and has almost 18 years teaching experience from the same university. His research interest includes Telemedicine, Cloud Computing, and Image Processing.

He has completed the Masters in E-Commerce from London, UK. He had completed Bachelor Degree in Computer Science and Engineering from The National Technical University of Ukraine, Kiev, Ukraine. He has successfully completed Cisco Certified Network Associate (CCNA), Microsoft Certified Technology Specialist (MCTS) and Microsoft Certified IT Professional (MCITP) on Server 2008 platform. He is also nominated Book Reviewer of The National Curriculum of Textbook Board. His research interest includes Operating Systems, Networking, and Microwave Technology.

