I J C T A, 9(41) 2016, pp. 783-788 ISSN: 0974-5572

ADAPTIVE BANDWIDTH ALLOCATION USING CELL UTILITY INDEX METHOD IN CALL ADMISSION CONTROL FOR WIMAX NETWORKS

Komaljot Kaur and Amitabh Sharma

Abstract: The cell migrations take place between the different network operators, and require the significant information exchange between the cellular operator for the flexible handling of the migratory users in the given cellular networks. The registration of the new users across the cellular networks requires pre-shared knowledge from the user's equipment, which signifies the user recognition before registering the new user over the network. In this thesis, this model proposes the robust call admission control (CAC) method for the multiple user engagement in the sub-channel domain. The major aim of the proposed model is to facilitate the maximum number of users across the given network by assigning the channels to the multiple channels. The proposed model is aimed at solving the issue by assigning the dual sub channels over the single communication channel. The proposed model performance has been evaluated in the various scenarios and over all of the BTS nodes. The experimental results have been collected from the simulation model for the estimation of the resource usage, overall network load and total transmission time along with the total bandwidth consumption over the given channel. The proposed model has been found efficient and effective in comparison with the existing models on the basis of the evaluated parameters.

Key Words: *Multi-channel sharing, sub-channel allocation, adaptive bandwidth allocation, calls admission control.*

I. INTRODUCTION

Today wireless LAN has become more extensively popular as a general-purpose connectivity alternative for a broad spectrum of businesses. Wireless LANs can be used to transmit data, voice and video within the single buildings, to different computers, and over metropolitan areas. Little information and new age technologies are introduced among the PDA (personalized digital assistants) and other communication equipments.

1.1 ADVANTAGES OF WIRELESS LANs

Wireless LANs offer the large spectrum of productivity gain, easy network management and cost reduction over traditional networks that use wires:

- Mobility - Real-time information can be accessed by the users anywhere in their organization using wireless local area network systems .This mobility helps in increasing the productivity and service opportunities which were not at all possible using wired networks.
- Flexibility in installation - Wireless technology allows the network to be extended to the areas where wires cannot reach
- Reduction in cost-of-ownership- Only the initial investment cost needed for a wireless LAN network component is higher than the cost of wired LAN hardware, overall installation cost and

Department of Information Technology, Chandigarh Engineering College , Landran, Punjab, India
Emails: komalmaan49@gmail.com, amitabh.it@cgc.edu.in

maintenance cost can be significantly less than wired systems. Long-term cost benefits are of greatest interest in environments that requires frequent location changes.

- Scalability – Various topologies can be realised using wireless local area network to meet the requirements of various applications and installations.

1.2 HOW WIRELESS LANs WORK

One access purpose will support a tiny low cluster of users and can operate inside a spread of lower than 100 to many hundred feet. The access purpose (or the antenna hooked up to the access point) is sometimes mounted high however is also mounted primarily anyplace that's sensible as long because the desired radio coverage is obtained. Wireless computer network adapters give associate in nursing interface between the consumer network software package (NOS) and also the airwaves via associate in nursing antenna. The character of the wireless affiliation is clear to the NOS.

II. LITERATURE REVIEW

Prasanna Shete et. al. has proposed the wireless LAN scheme for the 802.11 b/g Wi-Fi standard, which does not support the voice or video based real-time traffic propagation. So WLANs are not worthy for supporting real-time voice traffic. They give "SmartCAC", which without changing the basic access mechanism of IEEE 802. 11 guarantee QoS for voice traffic.

Gupta et. al. [5] has focused on the focused study of variety of wireless scenarios WiMAX using the quality of service (QoS) paradigm to smartly transfer the traffic among the nodes in the given networks. But in order to contend with the present existing other wireless technologies like Wi-Fi (IEEE 802.11), 3GPP/UMTS, Bluetooth (IEEE 802.15); WiMAX has to assure better QoS & cost efficiency.

III. EXPERIMENTAL DESIGN

In the proposed model, the smart algorithm has been designed for the proposed model. The bandwidth and channel allocation algorithm is the channel capacity algorithm, which analyzes the allocation of each link. The proposed model has been made capable of channel sharing mechanism, which may entertain the higher number of users than the available channel capacity. The proposed model works on the theory of sub-channel, which occurs when the one communication channel is shared among the multiple users. The following algorithm shows the sub-channel allocation to the users:

Algorithm 1: Active Bandwidth & Sub-Channel Allocation Algorithm

1. Load the list of primary and secondary topological parameters
2. Assign and begin the topological simulation for the target wireless networks
3. Input the number of communication channels across one cell ((N_C)
4. Input the sub-channel number for one channel ((N_C)
5. When received the request from user, check the no. of filled per used channels (*N*).
   $N = N_C \times N_{C_S}$
6. If $N_A < N_C$ (where N_A is no. of assigned channels), register the user with maximum possible bandwidth for each channel.
7. If $N_A > N_{C_S}$ && $N_A < N$, check and calculate channel ID,
   $K = N - N_A$

$K_N = N_C - K$,

Where K is the no. of available channels and K_N is the channel ID.

8. Check the no. of user on K_N i.e. U_N.
9. If $U_N >= N_{C_S}$, channel is busy, shift to new channel.

$K_N = K_N + 1$

10. If $U_N < N_{C_S}$, identify the existing user on K_N.
11. Slice their bandwidth by following formula

$BW_C = BW / (U_N + 1)$

12. Assign the channel and bandwidth information with the new node.
13. Assign default time slot and create the sink between node intervals.

IV. RESULT ANALYSIS

4.1 RESOURCE LOAD

Network Load is the amount of data (traffic) being carried by the network at a particular time. The network load varies from time to time. It is represented in bytes per second or packets per seconds**.**

$$\text{Network Load} = \sum_{t=1}^{n} \frac{\text{total data in processing}}{\text{capaty to process data}} \times 100 \quad \text{Eq.} \qquad (4.1)$$

Where, t = Time Interval

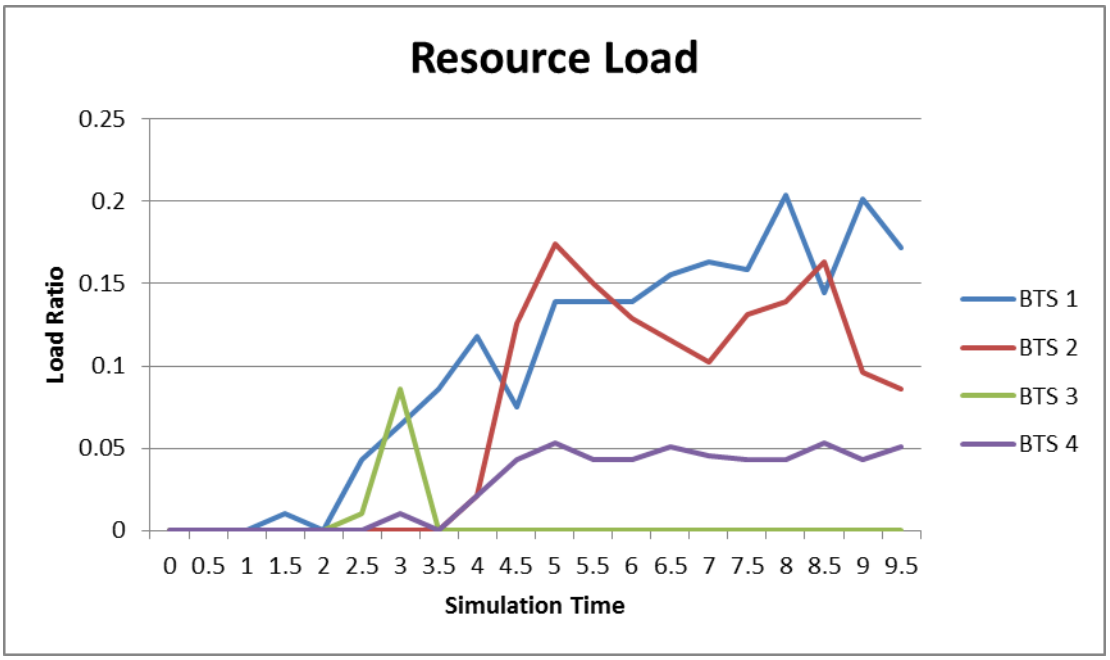

Figure 4.1: The results of resource load obtained from the simulation

4.2 DATA LOSS

The data loss is the parameter which indicates the performance of the proposed model in the form of data loss due to the link bottlenecks or due to traffic overflow or other similar or non-similar reasons.

$$\text{Data Drop Rate}=\sum_{t=1}^{\text{total data sent}}\left(\frac{\text{total data received}}{\text{total data sent}}\times 100\right) \qquad \text{Eq. 4.2}$$

Where, t = Time interval

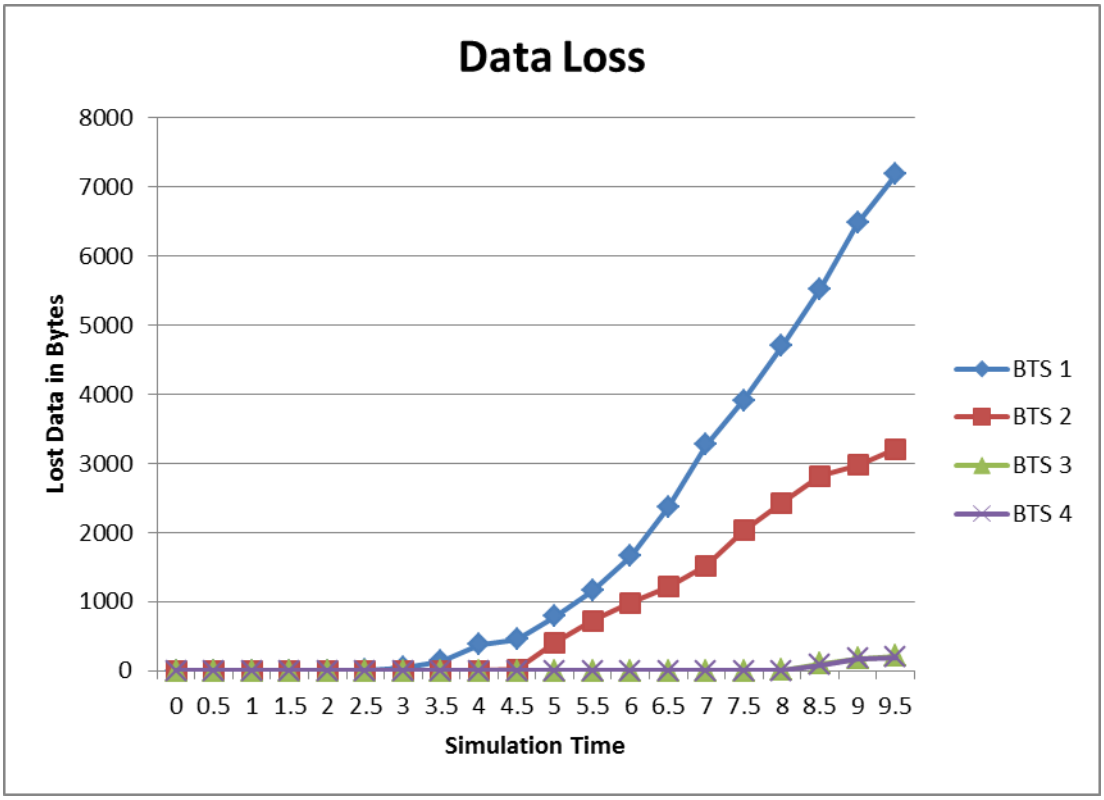

Figure 4.2: The results of data loss obtained from the simulation

4.3 AVAILABLE BANDWIDTH

For the computation of the bandwidth across the network, the equation utilizes the consumed bandwidth divided by the total available bandwidth capacity in order to get the percentage of the used resources, which has been given in the following section:

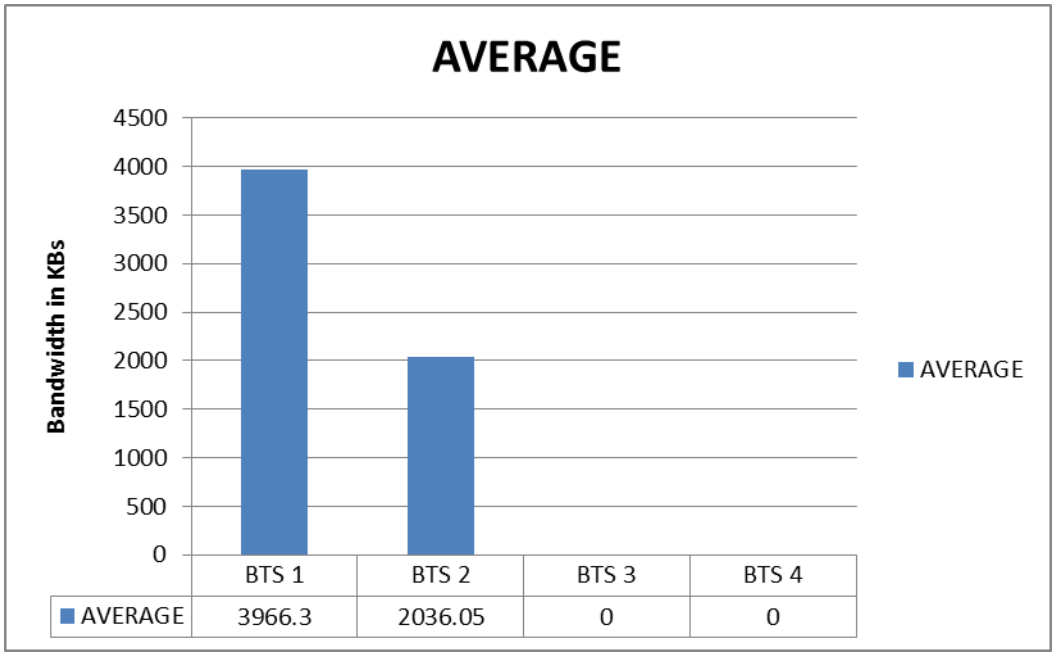

Figure 4.3: The results of available bandwidth obtained from the simulation

4.4 RESOURCE UTILIZATION INDEX

The cellular network resource utilization directly impacts the overall network performance and prevent the causes of the failures by showing the resilience behavior, which eventually gives the chances of overloaded and over-flooded networks in order to track the overall resource utilization.

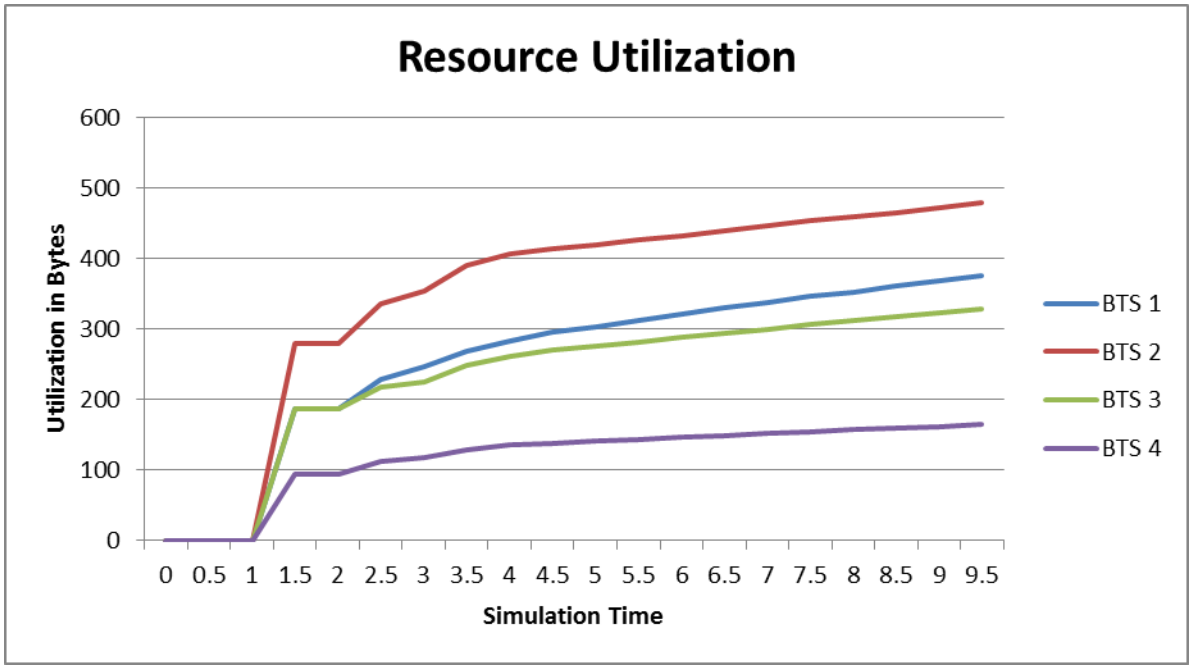

Figure 4.4 : The results of resource utilization index obtained from the simulation

V. CONCLUSION

The cell utilization index explains the engagement of the cell to its existing users. The proposed model has been designed to balance the load between the overloaded and under loaded cells in order to avoid the no coverage situation for the users. The proposed model primarily aims at resolving the problem of the cell data offloading by utilizing the migratory user handling mechanism. The primary aim of the proposed model is to facilitate the service call management from the other base transceiver stations (BTS) in the given networks, while staying connected to the another base station. The proposed model has been improved for the handling of the higher number of the users than the previous models by enabling the latter described service call management protocol over the other base station. The proposed model has been evaluated on the basis of the variety of the performance parameters such as the transmission delay, throughput, network load, etc. The proposed model has been considered to be efficient on the basis of the evaluated performance parameters in the proposed model.

REFERENCES

[1] B. Epstein and M. Schwartz, "Reservation strategies for multi-media traffic in a wireless environment," in *Proc. IEEE VTC'95*, vol. 1, Chicago, USA, July 1995, pp. 165–169.

[2] B. Li et al., "On handoff performance for an integrated voice/data cellular system," *Wireless Networks*, vol. 9, no. 4, July 2003, pp. 393–402.

[3] B. M. Epstein and M. Schwartz, "Predictive QoS-based admission control for multiclass traffic in cellular wireless networks," *IEEE Journal on Selected Areas in Communications*, vol. 18, no. 3, Mar. 2000, pp. 523–534.

[4] C. Huang and R. Yates, "Call Admission in Power Controlled CDMA Systems" , *Proc. IEEE 46th Vehic. Tech. Conf. (VTC'96)*, vol.3, 1996, pp.1665–1669.

[5] D. Bruneo et al., "Call Admission Control in Hierarchical Mobile Networks", *Proc. of the 10th IEEE Symposium on Computers and Communications (ISCC 2005)*, pp. 780-785

[6] D. Shen and C. Ji, "Admission Control for Multimedia Traffic for Third Generation CDMA Network", Proc. of INFOCOM, Israel, vol.3, 2000, pp.1077-1086.

[7] E.-S. El-Alfy et al. , "A learning approach for call admission control with prioritized handoff in mobile multimedia networks," in *Proc. IEEE VTC'01*, vol. 2, Rhodes, Greece, May 2001, pp. 972–976.

[8] F.-N. Pavlidou, "Two-dimensional traffic models for cellular mobile systems," *IEEE Transactions on Communications*, vol. 42, no. 2/3/4, 1994, pp. 1505–1511.

[9] Farhan Siddiqui et al., "Across hybrid wireless networks: Trends and Challenges", Computer Communications, 9 Sept. 2005.

[10] H. S. Ramesh Babu et al., "An Intelligent Call Admission Control Decision Mechanism for Wireless Networks", *Journal of Computing*, vol. 2, Issue 4, 2010, pp. 12-20.

[11] H. Wu et al., "On handoff performance for an integrated voice/data cellular system," in *Proc. IEEE PIMRC'02*, vol. 5, Lisboa, Portugal, Sept. 2002, pp. 2180–2184.

[12] J. E. Wieselthier and A. Ephremides, "Fixed- and movable-boundary channel-access schemes for integrated voice/data wireless networks," *IEEE Transactions on Communications*, vol. 43, no. 1, Jan. 1995, pp. 64–74.

[13] J. M. Peha and A. Sutivong, "Admission control algorithms for cellular systems," *Wireless Networks*, vol. 7, no. 2, Mar. 2001, pp. 117–125.

[14] M. C. Young and Y.-R. Haung, "Bandwidth assignment paradigms for broadband integrated voice/data networks," *Computer Communications Journal*, vol. 21, no. 3, 1998, pp. 243–253.

[15] Prasanna Shete and R N Awale, "SmartCAC: Call Admission Control scheme to guarantee QoS for Voice over IEEE 802.11 WLANs", *International Journal of Computer Applications*, vol 42, no. 6, Mar 2012, pp. 1-5.

[16] S. Wu et al., "A dynamic call admission policy with precision QoS guarantee using stochastic control for mobile wireless networks," *IEEE/ACM Transactions on Networking*, vol. 10, no. 2, Apr. 2002, pp. 257–271.

[17] V. S. Kolate et al., "Call Admission Control Schemes and Handoff Prioritization in 3G Wireless Mobile", *Int. Journal of Engineering and Innovative Technology (IJEIT)* vol. 1, Issue 3, 2012, pp. 92-97.

[18] Y. Fang, "Thinning schemes for call admission control in wireless networks," *IEEE Transactions on Computers*, vol. 52, no. 5, May 2003, pp. 686–688.